THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVI. No. 1948.] LONDON, SEPTEMBER 11, 1900. [52ND YEAR. PRICE 6d.

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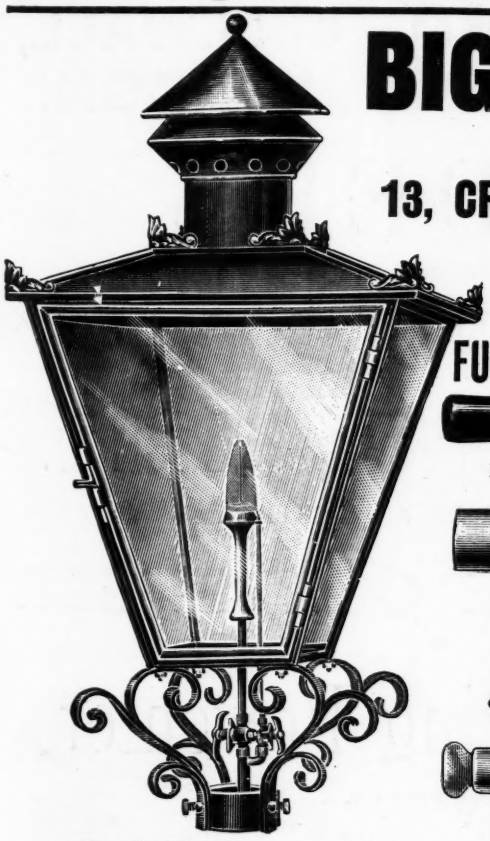
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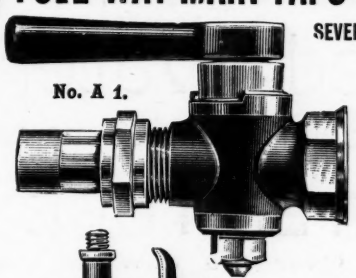
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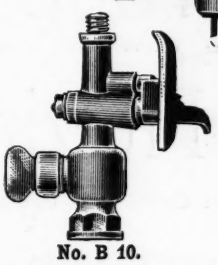
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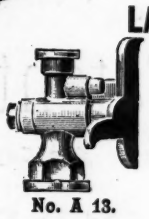
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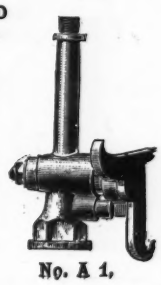
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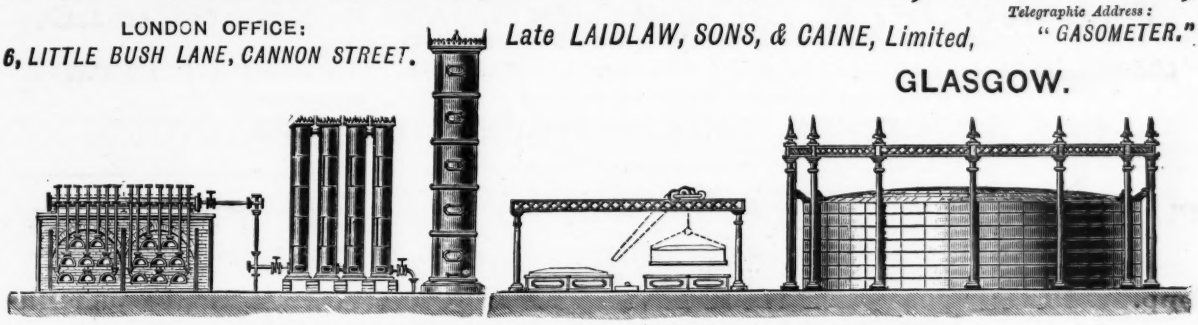

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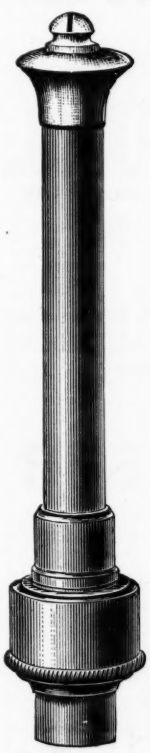

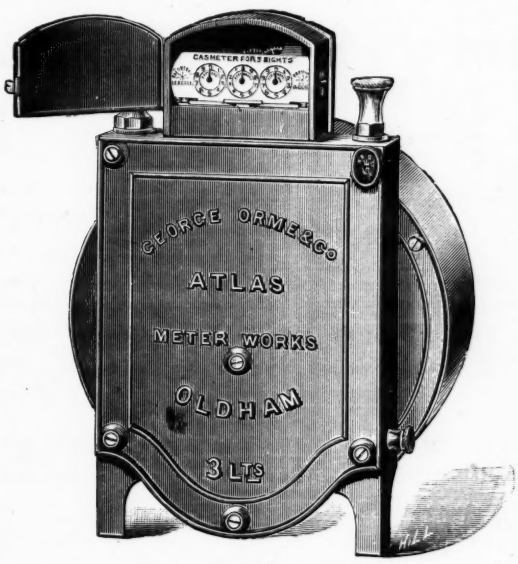

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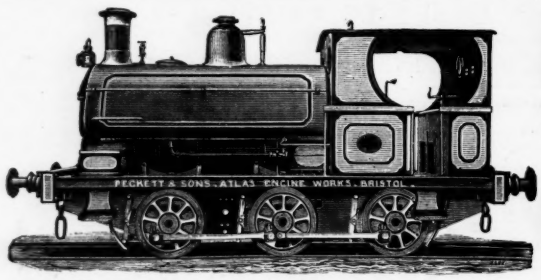

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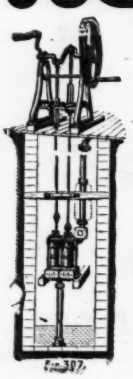

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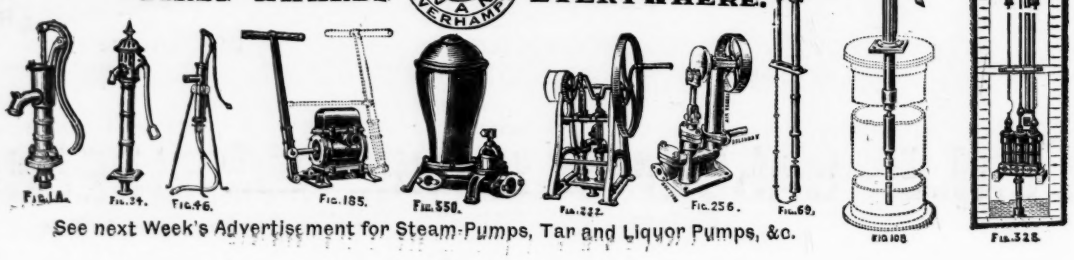

Fig. 307. Fig. 14A. Fig. 34. Fig. 46. Fig. 185. Fig. 559. Fig. 222. Fig. 256. Fig. 69. Fig. 108. Fig. 328.

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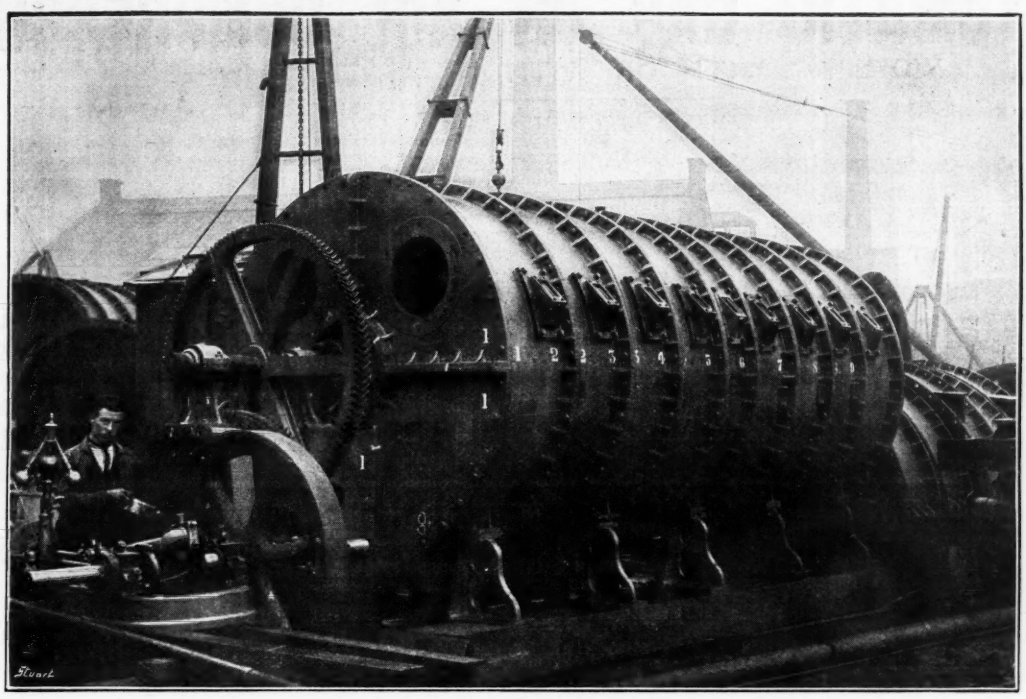

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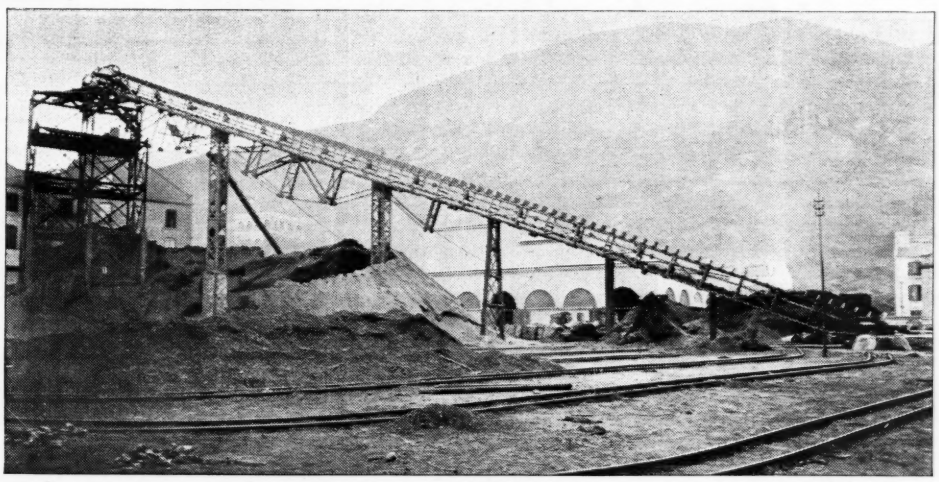

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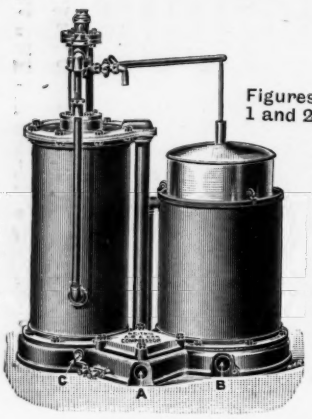
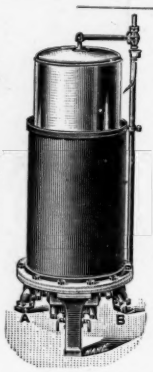
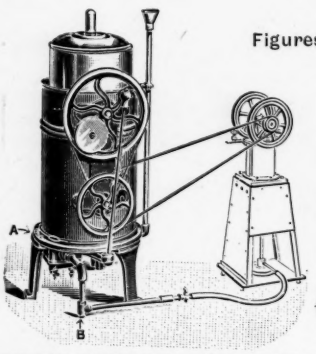
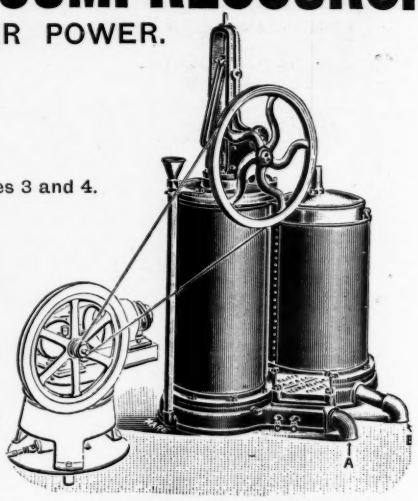


Figures 1 and 2.





Figures 3 and 4.



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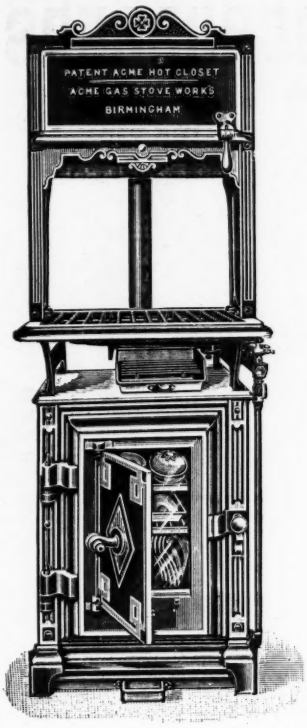

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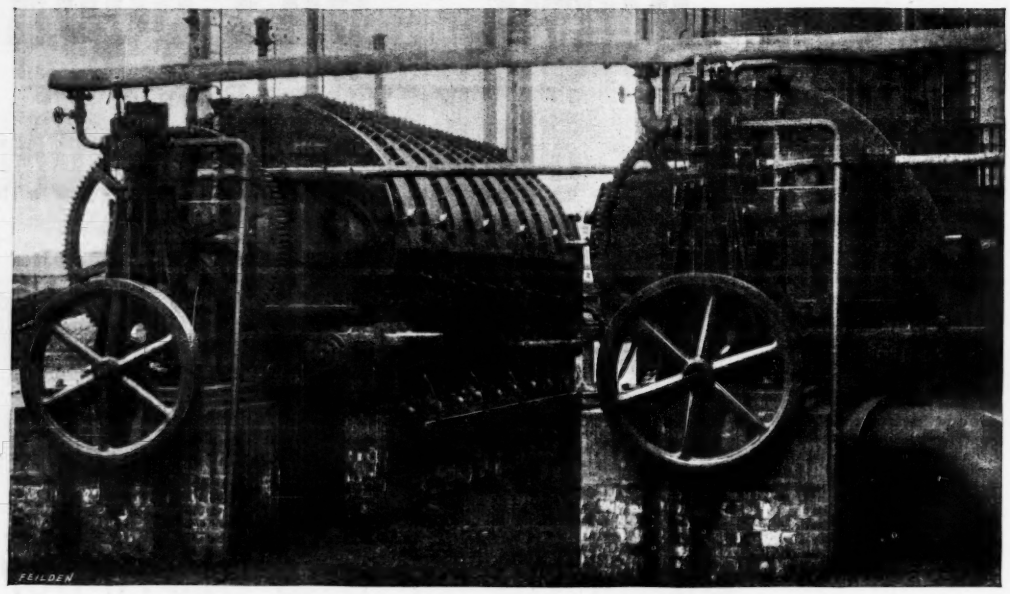

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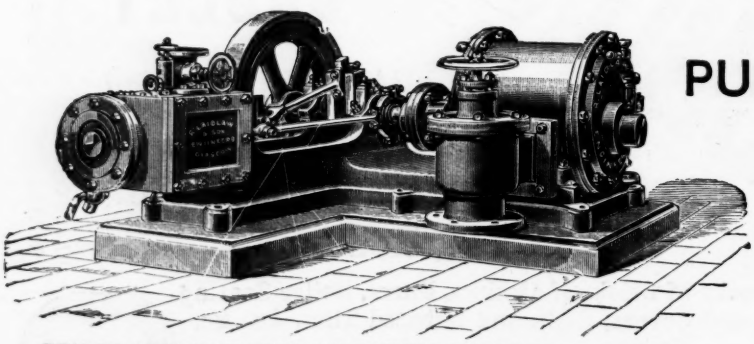

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Santiago de Cuba	400,000	Lea Bridge (2nd)	350,000	New York	4,000,000
Swansea	750,000	Stockton-on-Tees	500,000	Scarborough	800,000
Manchester	3,500,000	Edinburgh	2,000,000	Perth, W.A.	125,000
Brighton	1,750,000	Guildford	350,000	Bremen	550,000
Preston	1,400,000	Brentford	1,200,000	Maidenhead	225,000
New York	1,200,000	Syracuse, N.Y.	850,000	Epsom	225,000
Southport	750,000	Bridlington	150,000	North Middlesex.	150,000
Bath	1,000,000	Middlesbrough	1,250,000	Wandsworth.	1,800,000
Newburg, N.Y.	350,000	Croydon	1,250,000	Aarhus	800,000
Newburg (2nd)	250,000	L. & N.W. Ry., Crewe	700,000	Falmouth	150,000
Hoylake	125,000	Taunton	225,000	Southampton	800,000

SINCE JANUARY 1ST, 1899.

Hartlepool	750,000	Brighton (2nd)	1,850,000	Dublin (2nd)	2,000,000
Utrecht	1,000,000	Stockport (2nd)	600,000	Faversham	200,000
Deventer	150,000	Croydon (2nd)	625,000	Birmingham (Swan V'ge)	1,500,000
Portsmouth	1,000,000	Maidenhead (2nd)	225,000	St. Gallen (Switz.)	225,000
Bournemouth	1,000,000	G.L.&C.Co., Beckton	2,250,000	Colney Hatch	400,000
Aylesbury	150,000	G.L.&C.Co., Fulham	1,750,000	Southampton (2nd)	500,000
Hamburg	1,750,000	Tottenham (3rd)	350,000	Tunbridge Wells	1,000,000
Redhill	275,000	Sydney (Harbour)	500,000	Hebden Bridge	200,000
Dublin	2,000,000	Sydney (Mortlake)	500,000	Chorley	300,000
Posen	450,000	Manchester (2nd)	3,500,000	Liège	1,000,000
Dunedin (N.Z.)	150,000	Hull	1,500,000	Stafford	500,000
Lincoln	500,000	Longton	600,000	Bridlington (2nd)	200,000
Antwerp	1,500,000	Staines	600,000	G.L.&C.C., Beckton (2nd)	10,750,000
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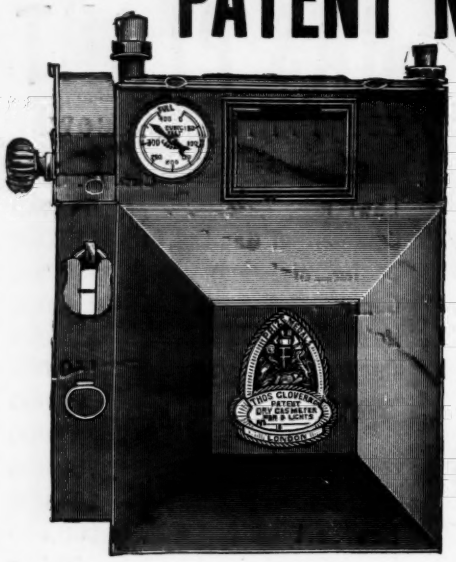

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EDITORIAL NOTES.

The Paris International Gas Congress—The Poverty of the English Gas Profession in the Higher Branches of Research.

THE great International Gas Congress in Paris—to which gas engineers of several countries have been looking forward for months past, and upon which many minds have been more or less concentrated in, as it were, drawing together the threads to ensure completeness—has come and gone; and it has supplied us with not the least interesting chapter in the history of the gas industry. To describe it as an unqualified success is not applying to it an adulatory term. And we are not by any means envious of that success; on the contrary, we (and we believe every English-tongued individual who was present at the Congress will unite with us in this) ascribe, with the utmost freedom and goodwill, to M. Th. Vautier and to his coadjutors upon the Commission d'Organization all honour and glory for their great achievement. In the history of the gas industry, such a gathering as this has been is unique. Never before has there been a meeting of gas engineers and managers of an international character—never before have members of the gas profession from different parts of the globe met on common ground to discuss and take counsel with each other on questions of common import, and (unconsciously, it may be, but inevitably) to tighten those bonds of friendship which a community of interests engenders among men, no matter what their nationality. Both place and time were meet for a great international gathering of the kind. The grand, though ephemeral, Exhibition of our neighbours made Paris an appropriate *rendezvous;* and, as to time, what could have been more apposite than that the century within which the gas industry has grown from an infantile to a gigantean state should be crowned by the meeting and mutual intercourse of many of the men of different countries who have assisted in its strengthening.

It could not be expected—however much desired—that all the leading men of the industry in all the great countries represented could attend. For instance, nothing would have more gladdened the hearts of the little body of English engineers who were present than to have had among them on this exceptional occasion such prominent men as —well, some dozen and more who might be named, were it not for the danger of doing an injustice by unintentional omission. But it was fit that the heads of the two leading gas organizations of the country should be there, and that they should receive the honour their positions merited. As Presidents respectively of the Institution of Gas Engineers and the Gas Institute, Mr. J. W. Helps and Mr. T. O. Paterson were nominated as Honorary Presidents of the Congress; and, for a brief space during the sittings, they (with the other foreign Presidents) assisted M. Vautier in the conduct of the proceedings. Distinction was also conferred upon the immediate Past-Presidents of such Associations as had rendered aid in the preparations for the Congress; they having been elected Honorary Presidents of the Organization Committee.

We have said that the Congress was "an unqualified "success;" and we abide by that. It was a success in numbers; it was a success in its truly international character; it was a success in the dissemination of a more general knowledge of the work of several countries on lines of present-day interest; and the quality of the major part of the papers (we must refrain from saying "all") left nothing to be desired. But a few hypercritical attendants may be disposed to question our measure of the Congress upon the ground that on some of the papers (and those not the least important ones) there was little or no discussion, and that on those which did excite debate the variety of language precluded a really intelligent following of the arguments adduced. But what else could be expected in an assembly constituted such as this? When the discussions are all converted into French, and published (as we hope and believe they will be) in volume form, it will be found an instructive record of the current opinions of many men of different countries on many current gas topics. It will, in short, mark the position of gas affairs at the close of this century.

In the subject-matter of the papers, in the exhaustive method of treatment, and in the character of the compositions, most of the writers showed that they had fully and correctly gauged the quality of matter that the importance

of the occasion demanded. The tone of the communications was, in most cases, carried to a higher pitch than would be expected (although we hold every man should always strive to give of his best) of, say, a contribution to an ordinary Association meeting. Some of them were voluminous disquisitions, and might, if only the purposes of the Congress and debate were in view, have been curtailed with advantage. But as records for study and consultative purposes, they are better as they stand. Many of the papers dealt with the higher branches of the *technique* of the industry. Mere administrative matters found no place in the programme; and, indeed, their presence would have been to a great extent superfluous and wasteful of time in an audience composed of representatives of different countries and of different peoples, in which, and among whom, questions of administration and policy must inevitably defer to their own peculiar conditions and circumstances. But the gas engineer and the gas technician of every country delve in common ground. There is no demarcation to the work of the investigative or studious gas engineer and scientist of any one nation represented at the Congress. Their work does something more even than overlap. In whichever country it is carried on, it is part and parcel of the same irresistible progress of development; and therefore every man's work, no matter where his location, must have a universal interest among the thoughtful and studious of his many compeers wherever they may be. Whether the worker be French, German, American, English, or of any other nation, his labour has only one object, and that is the advancement of knowledge—knowledge of the best means and methods of gas manufacture or its utilization, of the plant and appliances connected therewith, and of the processes for securing the most beneficial results, both for mankind and the industry itself, from the bye-products of that manufacture.

Therefore, we hold that the subjects introduced to the mixed assembly at the Congress were eminently appropriate. Many of them, as we have said, ran among the higher branches of gas technics. As one sat listening to the reading of the papers in the Congress Hall, and noted the interest which the great gathering of Continental gas engineers—both of large and of small works—took in the scientific questions discoursed upon, the truth was demonstrated, perhaps more forcibly than ever before, that every gas-works, whether great or small, is an entrance to those large fields of research upon which several of the papers threw light. Want of time and ability, however, may be barriers to the prosecution of investigation. The former may be (and we will admit is, in many cases) a good reason for leaving such work to others; but to the latter—the want of ability—few men will confess. With the opening before him, if a gas engineer has the ability, if he has the aptitude, if he has the time, and if he does not take up some line of research connected with his profession—well, then, he does an injustice to himself and to that profession. Looking round at our own Associations at home, in nearly every one we can pick out men—but, alas! the percentage is small—who have pursued, and are pursuing, original research in some branch of their work; and it would not be difficult, did it come within the province of a journalist (and we are glad it does not) to pick out other men just as favourably placed whose contributions to the profession have either been *nil*, or have lacked the stamp of originality or personal inquiry. Why is it? Have gas engineers on the Continent more time than our engineers at home, or have they more ability? We are certainly not going to admit that they have either; and yet their productions, as the result of personal investigation, clearly put our records to shame. Where, may we ask, did England stand at the Congress in the matter of contributions? A great country, with a great gas industry; and yet only two Englishmen subscribed written matter for the proceedings! And, moreover, those two Englishmen were associated with Continental (not purely British) gas undertakings. Let those who will be proud of the position England occupied at this Congress; we are not. "We were once the "teachers in the gas industry; now we are the taught." This, in effect, is what Mr. Helps felt constrained to confess, before a large number of Continental gas engineers in Paris only ten days ago. What an admission for the President of the Institution of Gas Engineers to have to make! May this Congress be the turning-point. Let all who have the ability be up and doing, and not leave the prosecution of research to the few; and let the technical literature of the country bear witness that the gas profession of Great Britain does not intend to take a place behind other countries in the matter of investigation in the higher branches of its work. Over this let one and all ponder.

We started with the intention of writing about the Congress; but our thoughts have run into another channel. Before concluding, however, one thing must be here acknowledged—the exceeding great kindness, courtesy, and hospitality which the Société Technique du Gaz, the Paris Gas Company, and many others in the city, showed to their guests throughout the past week.

Coal Exports.

THE Board of Trade returns of the coal exports during the month of August afford one explanation of the continued hardness of the market, and are not good reading for the coal buyer. The total quantity exported—including coal shipped for the use of steamers engaged in foreign trade—was 5,140,235 tons, as compared with 4,811,290 tons last year, and 3,979,646 tons in August, 1898. The increase of 328,945 tons for the month over the shipments in 1899 brings the total increase in the exports this year, as compared with last, up to 1,161,270 tons. The quantity shipped in the first eight months of 1898 was nearly 8 million tons less than during the same period of this year. France is far and away our biggest customer, and also the one whose imports of our coal have increased most heavily; she having already taken well over 1 million tons more this year than last, and nearly 2¼ millions in excess of the quantity bought from us in the corresponding period of 1898.

The increased requirements of France afford, indeed, a striking proof of the activity of trade in that country, which, coupled with labour difficulties, have made her a pressing customer in the coal market. This, as we all know, has caused a lot of excitement in the heads of those who fill the columns of the "Yellow Press;" and it has been sought to represent that France is now sucking us dry of coal in order to be able successfully to swoop upon us on some day—we forget the exact date—in November next. As France is importing at the present time as much coal in one month as our own Navy uses in twelve, the theory that her purchases are solely intended for use in times of war scarcely bears examination.

Another large and increasing customer in the English coal market is Germany. Indeed, if coal imports be a safe guide as to the warlike intentions of our European neighbours, France, Germany, Russia, and Italy are all preparing to pounce upon us; each of them having bought over half a million tons of coal last month. It has, unfortunately, to be added that there appears no immediate prospect of a material reduction in the demand from the Continent. Only last Friday the Prussian Ministry—"in view of the growing "scarcity and dearness of coal"—resolved to reduce the railway carriage rates on foreign coal, in order to render more easy its importation from England and Belgium; while Russia's needs for fuel continue so great—a railway nearly 4000 miles in length involves a heavy fuel bill in its construction, and in the maintenance of the service over the completed sections—that the Government there have recently prolonged the suspension of the duty formerly imposed on coal imports.

We have all been and are looking to the intervention of American coal to relieve the situation; but the threatened great strike of miners in Pennsylvania—the number is put at 100,000, equivalent in the States to an output of nearly a million tons a week—will, if it become an accomplished fact and be prolonged for any considerable length of time, naturally tend to upset these calculations. On the other hand, the stoppage of the Lancashire cotton mills for two or three weeks (owing to a dearth of the raw material) will have a considerable effect upon the engine fuel market in that part of the kingdom; the effects of the Taff Vale strike will soon have disappeared; and the rush to buy household coal is dying away. The uncertain factor is the output; and here everyone is really in the dark. No returns are available as to the tonnage raised each month; so that it is impossible, until the figures for the year are published—about next February, perhaps—to say to what extent the statements constantly made by coal owners and factors as to the bad working of the men, are accurate or exaggerated. The probabilities all lie in favour of slacker working; but (bearing in mind that, in spite of similar asseverations by the colliery proprietors, the output per man last year proved to have been heavier than previously) we should like to have definite figures to go upon. The Board of Trade could not

do any greater service to the industrial community than by arranging to procure and publish every month the actual quantity of coal brought to bank in this country. That would be a service which the coalowner would by no means appreciate, while the coal buyers—which is to say the community at large—would do so very greatly.

The Trade Union Congress and the Law of Picketing.

Of all the many and various disillusionments which the experience of a lifetime brings to everyone, that which proceeds from the discrepancy between profession and practice, between the name and the thing, is perhaps the one most constantly surprising as it is perhaps the most familiar. One is always being disappointed at discovering some example of this disconformity of promise and performance; and yet it is what one expects, as a matter of course. The world of politics, using the word in the wide sense, is full of these discrepancies. The Progressive turns out to be the most obstinate of obstructionists; the Moderate, the fiercest of partisans. The Free Trader often practises the strictest Protection whenever he has the opportunity; and the firmest believer in direct taxation levies all the indirect duties that he can manage to stick on under some other name. The representative of Labour does no manual work; the professing Practical Man is the craziest of theorists. And so on. The Trade Union Congress is not good for much; but it is a splendid example of what we have just sketched out. Here is a gathering of people regularly accredited as delegates from the Societies supposed to represent the thought and the aspiration of the followers of the trades after which they are called. These delegates are free men, in a free land. They have it in their power to meet wherever they please, without asking anybody's permission; and to say the thing they will, in spite of everybody. In theory, these are ideal conditions for the cultivation and advancement of that sound counsel which is supposed to originate in free discussion. Surely, it might naturally be thought, these practical men, these horny-handed sons of toil, will be as businesslike and effective in counsel as they are in their places at the loom or the forge. The workman needs but few words in his employment. Hour by hour, as he toils in silence, his mind may be revolving the things most nearly influencing his daily life and the conditions of his calling. Once a year, at least, as the scheme of the Trade Union Congress seems to provide, the great mass of silent workpeople shall, however, be given voices, and the opportunity for making them heard. The rest of the world is pompously bidden to listen to this Parliament of Labour; and politicians and newspapers duly bend to hear what the free and independent workman has to say for himself. One has but to look at the theory of the Congress in this light to perceive how ludicrously short the realization falls of the ideal.

This year, all these practical men (numbering some 400) went to Huddersfield, and presumably enjoyed themselves thoroughly in talking and listening to many vaguely Socialistic speeches which they all knew to be so much empty sound. The President of the Congress was a local Trade Union magnate, who entertained his supporters to a literary feast in the shape of a scholarly (of a sort) exposition of the "scientific and philosophical aspect" of the "Labour "Movement." This was sufficiently fantastic; but it was distinctly funny to note how easily this philosophic and scientific Trade Unionist led his argument from the conditions of life upon the earth during the glacial epoch to a fervid denunciation of the present "unholy war." After this, it was but natural that the first "business" transacted by the Congress should be the passing of a resolution protesting against the suppression of the late Boer States as "a blow against the independence of South African "labour, and those principles of national freedom which "have characterized the history of the closing century." This performance has been cited, with much force, as likely to awaken the ordinary newspaper reader to a correct perception of the degree in which this egregious Congress accurately mirrors the feeling of the working classes of the country. Like the circus manager of the old story, however, the real wire-pullers of the Congress soon "cut the "cackle, and brought in the 'osses," by concentrating the attention of the delegates upon the state of the law as regards picketing.

Here we feel upon sound ground. Philosophical and scientific justifications are all very well so far as they go. But they do not win strikes; while picketing, properly done, does. That is all about it, to a true Trade Unionist. Men like "Mr. Jones (Upholsterers, London)," who moved a resolution relating to this subject, and Mr. Bell, of the "Railway Servants," know that, as the law stands, it interprets the Conspiracy Act in a sense which is, as Mr. Jones's resolution put it, "a danger to the operations of the "Unions." Consequently, Mr. Bell's Society have determined to carry their case to the House of Lords, so as to get a final decision as to the law of "watching and "besetting." In the same boat are the Belfast Butchers, who have vainly spent £600 in law-costs with the object of defending the legality of the action of their Society in asking a firm not to buy meat from a particular salesman while they had a dispute on. The Congress has commended the Belfast Butchers to the good offices of English Trade Unions.

Meanwhile the Railway Servants have been placed in an admirable position for approaching the House of Lords; an injunction having been granted against the Society, as well as against the officials Bell and Holmes individually, at the instance of the Taff Vale Railway Company. This is the first time that a Trade Union has been held liable for such acts as picketing. The judgment is of enormous importance, not only upon the main issue, but also on the preliminary question of the responsibility of a Trade Union for the acts of its officials. Mr. Justice Farwell has just decided that, in an action in tort, such a Society is liable. In future, therefore, whoever suffers from the "operations" of a Trade Union will be able to seek his legal remedy against the Society itself, and not against the individuals —usually men of straw—who acted as its agents. Well may the Trade Union Congress decide to support Mr. Bell's Society in contesting this judgment to the uttermost Court of Appeal. If it is upheld, the Trade Unions will have to rely more than has been their wont upon philosophy and science, and less upon brickbats.

This is, speaking generally, the only question of practical politics for the Trade Unions of the country to deal with at present; and a Congress is not the proper arena for settling a matter of this kind. So arrangements have been made whereby it is hoped less scope will be allowed for mere purposeless talking. Hitherto the Chairman of the Congress has been the most prominent Society man in the town visited; and this has placed the gathering at the mercy of any empty talker who happened to dominate the local "Labour platform." Consequently, year after year, the men who are the real wire-pullers of the Trade Union movement have been compelled to sit still while local nobodies vapoured away on the well-worn generalities of Collectivism, which neither hurt nor advantage anybody. This is to be changed; and the Chairman of the Parliamentary Committee—the real Executive of the Associated Unions—is to be Chairman of the Congress also. The change is in the direction of practicality; but we doubt if ever the Congress will become a body to be taken seriously.

The Address of the President of the British Association.

The meeting of the British Association at Bradford is naturally attracting much interest. It is a great relief to turn from the empty verbiage which ordinarily fills the newspapers at this season, to the solid columns which at least once a year record the gains of science. After all, science is only a short name for accurately known facts, properly understood. The name of science has been much blown upon in consequence of the unscientific behaviour of many who profess and call themselves scientific men. There is still a good deal of human nature in man, as the humorist has observed; and it is in consequence of this that many a man who should have remembered that he is nothing if not strictly scientific, has turned his chair into a pulpit or an electioneering platform. This weakness on the part of some professors has tended to bring science itself into disrepute as a way of mental culture. It is when the scientific man sticks to his science that he dignifies himself and ennobles his profession. The British Association presidential address this year is a shining example of this truth. The President is Sir William Turner, F.R.S., perhaps the most distinguished of living English anatomists. His address, we observe, has been unfavourably commented upon in some quarters, because it was confined to the speaker's speciality, and did not give a popular summary of the progress of science in all departments for the year. Readers of the "Journal," who have an exceptionally intimate acquaintanceship with presidential addresses, of which class of technical compositions we report very many every year, are aware that we hold this

omnium gatherum description of address in the liveliest horror. It is scarcely ever well done; and there is the special objection to the style for a scientific man's address, that he is obliged to give most of the story upon hearsay testimony. There is no Science of Universal Information. A true man of science will shrink, as from a deadly sin, from telling anything except as he knows it.

For this reason we very warmly applaud the discretion of Sir William Turner in speaking of the matter of his own science, which is concerned with the structure and organization of the bodies of man and animals. There is, of course, nothing for the "JOURNAL" in this special portion of the address; but there is much instruction for every humble follower of the scientific method, which is of general validity in the deep and broad foundations of this masterly composition. What is the scientific method, by which alone can the amount of positive human knowledge be increased? It begins with Gibbon's requirement of "dili- "gence and accuracy" on the part of an historical writer. No student can make progress without exercising these qualities. But much more is needed to the successful and profitable prosecution of research. Diligence and accuracy must be supplemented and governed by judgment and insight. They require to be practised by a man who has the superior capacity to discriminate between what is or is not worth doing or knowing. For the power to value facts and to decide on their true significance, a well-balanced mind and the exercise of prolonged thought and reflection are needed. The possession of this power distinguishes the wise man from the pedant.

Sir W. Turner, in the course of his address, drew from biological science his illustrations of the need of this combination of observation with meditation. But he was quick to point out that the same conjunction influences and determines progress in all the sciences. And when this is associated with the indefinable something which Sir W. Turner was content to call "a sufficient touch of imagination"—by which he meant the power of seeing conjoined with the power of foreseeing, of projecting the mind into the future—we may expect something more than the discovery of isolated facts. Their co-ordination and the enunciation of new principles and laws will necessarily follow. "Scien- "tific method consists, therefore, in close observation, "frequently repeated so as to eliminate the possibility of "erroneous seeing; in experiments checked and controlled "in every direction in which fallacies might arise; in con- "tinuous reflection on the phenomena observed; and in "logically reasoning out their meaning. Were the method "followed out in its integrity by all who are engaged "in scientific investigations, the time and the labour "expended in correcting errors would be saved, and "the volumes devoted to scientific literature would be "materially diminished in size. Were it applied, as far "as the conditions of life admit, to the conduct and "management of human affairs, we should not require to "be told, when critical periods in our welfare as a nation "arise, that we shall muddle through somehow. Recent "experience has taught us that wise discretion and careful "prevision are as necessary in the direction of public "affairs as in the pursuit of science; and in both instances, "when properly exercised, they enable us to reach with "comparative certainty the goal which we strive to "attain." These words, which every worker who is not a mere drudge should take to heart, would alone redeem an address from all reproach of emptiness. There are many others of like quality which cannot be reproduced here.

The Question of Compulsory Arbitration.

REFERRING to the Taff Vale strike, one of our contemporaries remarks that its occurrence "must hasten the "time when, in the interests of commerce and of humanity, "the possibility of compelling recourse to some tribunal of "compulsory arbitration will have to be decided by public "opinion." This, it is true, is a very tentative and non-committal reference to compulsory arbitration as a means for settling trade disputes; but, as other more definite proposals for the adoption of such methods have been made in connection with recent labour troubles, and as attention is being called to the fact that the colony of New South Wales is about to legislate on the question on lines similar to those of the New Zealand Act—the author of which has been recently blowing its trumpet in the Daily Press—it may be as well to remind our readers of some of the results arising from the working of compulsory arbitration in the last-named colony. Those results were described at some length in the "JOURNAL" last October, in a notice of an article in the "National Review" by a member of the Legislative Council of New Zealand—an article which, as we said, contained a whole armoury of weapons wherewith to defeat any proposal, were such ever seriously made, for introducing a scheme for the compulsory settlement of labour disputes in this country.

The results of the working of the New Zealand Act have been, briefly, as follows: First, it has led to the manufacture of disputes upon trivial points, raised by the Unions—not, in most cases, by the men themselves—in order to bring employers before the Court of Arbitration for the purpose of dictating to those employers, through the medium of the Court, as to the management of their business; the awards of the Court being enforceable by fine or imprisonment. One such award, it may be remarked, was to the effect that the employer was to give preference to members of the Union over non-unionists. The second result, consequent upon the first, has been that of immensely strengthening the Trade Unions, and making them virtual masters of the trade of the country. This has, naturally, led to a third result—namely, to embittering instead of improving the relations existing between employers and employed. The Trade Unions have, in fact, been enabled, by a clever handling of the Act, to largely get the upper hand; yet not so thoroughly as to satisfy them, for they have been agitating for an amending Act, one of the provisions of which would have made it a breach of duty for an employer to discharge a workman for being a member of a Union, and would have laid upon the employer the onus of proving that the discharge of any workman was not due to such cause!

We have thought it well to recall the results of the New Zealand Act, as described by an observer living in the colony, at a time when labour troubles are in the air, and when well-meaning individuals (who are often unconsciously very ill-doing) are certain to make plausible proposals which would be admirable, and would largely advance the Millenium—were human nature not human nature, and Trade Unions what they might be and not what they are. "If," observed the writer to whom we have just referred, "the New Zealand system can be said to have "any value to other countries, it is as a beacon warning "of danger, and not as a pattern to be imitated." Fortunately, as the proceedings at the recent Congress demonstrated, the Trade Unions of this country do not appear to be greatly enamoured of the proposed method of settling disputes; for a resolution in its favour was defeated by a large majority. Employers will not quarrel with that vote.

The Lighting "Interests" of Dublin.

THE observations and reflections on the remarkable history of electric lighting enterprise in Dublin which constituted our last week's "Electric Lighting Memoranda," have not proved palatable to certain personages who are more or less responsible for the state of things described. They were not meant to be. The strange jumble of influences which eventuated in making the proposal to further encumber the estate of the ratepayers of Dublin to an unknown amount—beginning with a "twopenny-halfpenny" job of a quarter of a million or so—a test of the practicability of Home Rule, does not make a satisfactory story. For this, not the narrator but the author is responsible. The most objectionable aspect of the tale is the predominant part played by various "interests," and the consequent subordination of merits to partisan influences. For pointing this out, we have been condemned in the usual strain by the "Freeman's Journal." It is no concern of ours which or whose interest this particular Dublin newspaper has defended throughout the negotiations that preceded the recorded result. Let it be granted that the "Freeman's "Journal" is the freest and most independent of the numerous organs of Dublin opinion. It is certainly free enough in imputing special interest to the "JOURNAL," which it alleges to be "terribly perturbed" by the decision of the Dublin City Council on the electric light question. It goes on to remark that, "when the matter was under "discussion, the public was assured that the gas interest "was all in favour of the Corporation proceeding with the "scheme. But now the organ of the gas interest denounces "the whole scheme, and bewails the fact that the Cor- "poration would not accept the Tramway Company's "offer. . . This disinterested criticism now reveals "upon which side lay the hopes of the gas monopolists "in the recent controversy." The imputation here is

plain enough. We have no objection whatever—quite the contrary, indeed—to any newspaper regarding the "JOURNAL" as the organ of the gas interest. The word "industry" would be preferable, in this connection, as possessing a wider and purer significance; but that is a question of taste. For us, the gas industry is the gas interest; and to this cause the "JOURNAL" is devoted. Otherwise, it would have no reason for continuing to exist. But the Irish newspaper now under notice does not understand the words it uses in this general sense. For it, the gas interest is the interest of the "gas monopolists" of Dublin—that is to say, of the Alliance and Dublin Consumers' Gas Company. It is accordingly insinuated that the words of the "JOURNAL" upon the Dublin Electric Lighting Question are those of the Dublin gas proprietary and their officers. More—the asserted circumstance of our last observations on the subject being incompatible with some assurance at one time accepted as stating the views of the Dublin Gas Company on the same matter, is cited as furnishing proof of there having been some dark double-dealing in this regard. As we remarked in the article complained of, all this is Irish to the core. In justice to the Dublin Gas Company it should be stated in the plainest terms that the "JOURNAL" does not belong to them. Our views on the electric lighting of Dublin may be just or ridiculously mistaken; but they are at least not inspired by the Gas Company. We have criticized this Dublin affair on the merits. The view we took was that of the Select Committee of Parliament which investigated all the schemes. The victory of the Dublin Corporation was brought about by one of the most shameless political jobs in Irish history, which is saying much. If the "Freeman's Journal" can delete the record from the Parliamentary Votes, then we will retract the statement; otherwise the evidence stands in our favour.

A New Discovery in Ventilation.

As all the world knows, Sir Benjamin Baker is an Engineer in the highest sense of the word—that of a man who can do things. Necessarily, he is able to do things, because he knows a very great deal about the capabilities of other things in general. A notable example of the connection in Sir Benjamin Baker's mind between knowledge and power may be found in a letter of his to "The Times" on a subject which appears to have considerably exercised the popular mind—the thought of what might happen to a trainload of passengers in one of the new underground railways, if the motive power broke down and the ventilation simultaneously failed. Suffocation in more than Egyptian darkness seems the result generally expected. Such fears are, one is glad to think, groundless. To explain them away, Sir B. Baker published a statement which makes the strict chemists' view of what is good air for breathing look rather ridiculous. Our readers will perhaps remember that we recently had a small controversy on this head with a chemist correspondent. It may also be remembered that some authorities on sanitary science have recognized the fact that mere superfluity of carbonic acid, as it exists in the air of carbonic acid gas-works, does not appear to materially affect the health of those who breathe the mixture. Sir B. Baker has now capped these facts with the declaration that the quality only too well known as an "oppressive condition of the air" is due more to temperature than to chemical composition. He says: "It has been practically demonstrated by physiological and "chemical experiments that a live man might be sealed up "in a lead coffin for half-an-hour without any resultant feel-"ing of oppression—I say nothing of depression—provided "he were treated as frozen mutton in a cold store, so that "the air he breathed, though astoundingly foul from repeated "breathing, might still remain cold." This frank statement puts a fresh aspect upon the problem of ventilation. If for "pollution of the air" one is to understand "undue raising "of the temperature," it clearly follows that one's ideas of what to do and what to avoid in the ventilation of gas-lit and other apartments must be reconsidered.

Herr Dicke on Water Gas: A Correction.—We regret to find that in the article by Herr H. Dicke on "Water Gas as a Remedy for the Prevalent Scarcity of Coal," in the "JOURNAL" for the 28th ult. (p. 522), the estimated production of steel in Germany at the present time was inadvertently stated as 200 million instead of 2 million tons annually. The production in 1896—viz., 1,543,100 metric tons—was correctly given in the article.

THE INTERNATIONAL GAS CONGRESS IN PARIS.

PROCEEDINGS IN THE PALAIS DES CONGRÈS AND ELSEWHERE.

SEPT. 3 TO 8, 1900.

M. THÉODORE VAUTIER, PRESIDENT.

A REVIEW OF THE PROCEEDINGS.

THERE was quite a bustle in the precincts of the hall of the Palais des Congrès on Monday morning of last week just before the early hour of nine o'clock—the time fixed for the commencement of the great International Gas Congress, organized by the Société Technique de l'Industrie du Gaz en France. In the annexe to the hall were ranged long tables, on which were piles of the papers to be read, and large sheets of paper carefully ruled into divisions and headed for the reception of the signatures of the delegates from the various Gas Associations of the world. Looking down these lists afterwards, we saw the signatures of men whom we and the gas profession at large delight to honour—men whose lives seem to be (and manifestly are) devoted to the profession of which they are leaders, and which they have assisted to raise from a mere rule-of-thumb practice to a scientific and intellectual level. We would suggest to the Société Technique that the interesting sheets bearing their signatures, and of all the men gathered together at this the first great International Gas Congress, should be preserved as a memento of the occasion; and upon this record will gaze, with respect and admiration, future generations of gas men who have followed and filled the places of those who will, in time to come, be known only by their work. Walking among the large crowd assembled, the multifarious languages which greeted one's ears were almost confusing. It was quite a study, however, to watch and listen to these many men who are working at the same profession the world over. In action and words, and on countenances, were excitement and pleasure expressed. Old acquaintances—some probably who had been separated for years—met and renewed their friendly relations; introductions were made; and new friendships were formed, which, though distance perhaps so soon as to-day has placed a broad gulf between them again, will ever remain dear. If the Congress results in nothing else than the drawing of the gas profession of different countries together, a not unimportant work will have been accomplished. Knowledge of a man creates a greater interest in his work; and what a Bunte, a von Oechelhaeuser, a Vautier, and many other men are doing will now to many excite a greater personal interest in England, America, Austria, Italy, and the other countries mentioned below.

Faithful to their promises, few of the "foreigners" (which description applied to our own English party sounded strange) who had promised attendance failed to put in an appearance; but a considerable number neglected to append their names to the roll. According to the latest returns just before the Congress, England had promised to contribute 70, Germany 110, America 40, Austria 30, Belgium 29, Holland 60, Italy 60, Russia 10, Switzerland 35, and divers 20—making a total of 460. But the signatures which appeared on the presence-sheets of the first day's meeting were approximately a score from each of the countries excepting England, who subscribed something like fifty. When the bell rang announcing that the President (M. Th. Vautier) was prepared to commence the proceedings, there filed into the hall nearly sufficient to fill it—of course, the members of the Société Technique du Gaz being in evidence in preponderating numbers. But even when the room was fairly well packed (which was only once during the whole of the sittings, and that was during the delivery of the President's "allocution"), there was nothing like the 1100 which the President had anticipated. But there were a great number who only paid flitting and periodical visits to the *séances*, and a few who, though in Paris, did not—we regret exceedingly—trouble to attend at all. But the bell had been rung, and the hall was filled; and on the raised platform were the President, with the General Secretary, M. Ph. Delahaye (to whom be all praise for his indefatigable exertions in making the Congress a success), the Honorary Presidents (who had received this distinction as Presidents of the foreign societies represented), the recording Secretaries of the different countries who had, as mentioned last week, engaged to prepare summaries of the proceedings, the Secrétaire-Archiviste (M. F. Villeneuve), and some of the members of the Organizing Committee. The Honorary Presidents who took their places at different periods on the platform were: Mr. James W. Helps, of Croydon; Mr. T. O. Paterson, of Birkenhead; Mr. George G. Ramsdell, of Philadelphia; Mr. William M'Donald, of Albany (U.S.A.); M. E. Beer, of Berlin; M. D. J. Cramer, jun., of Rotterdam; M. Victor Krafft, of Naples; M. Hubert Nachtsheim, of Vienna; M. Rothenbach, of Berne; and M. Verstraeten, of Brussels.

Of course, the central figure on the platform was M. Vautier,

whose industry and natural aptitude for leading and controlling had brought about the Congress; and if anything was wanting in the course of the proceedings which would have enhanced their value, it cannot be charged to any lack of exertion or aforethought on the part of M. Vautier. A few words will make him better known to our readers. In the columns of the "JOURNAL" his name has been brought intimately before the gas profession of this country; and several English engineers can claim a personal acquaintance, through the very graceful reception of, and courteous address to, the members of the Gas Institute on the occasion of their visit to Paris in the early part of the summer. In scientific circles of France, M. Vautier holds high rank. He is a Civil Engineer, a Doctor of Physical Sciences, Professor of Science at the University of Lyons, President of the Société Technique du Gaz en France, and holding that position he has presided over the work and deliberations of the Organization Commission for the Congress. Such being his qualifications, he was eminently fitted to occupy the distinguished position of President of the Congress. With regard to M. Vautier's connection with the gas profession, he is so placed that he has obtained a peculiarly wide acquaintance with the gas industry of countries in the south of Europe. In Lyons, he directs an office which centralizes the administration of a large number of Companies (some of whom are suppliers of both gas and electricity) in France, Italy, and Spain. M. Vautier is a Director of these various Companies; and he succeeded in these duties his father, M. Emile Vautier, who took a leading part in the foundation of the Companies in Lyons about the year 1840. M. Vautier's name is a prominent one in the transactions of the Société Technique, to which he has contributed the results of his study of several subjects—notably on the enrichment of poor gas by acetylene; on the mixing of acetylene and ordinary gas; on the photometrical measurement of different incandescent burners; and, as our columns have not long since testified, he has published a learned disquisition on the photometrical methods employed in France and other countries. In the domain of Physical Science, M. Vautier is the author of several experimental researches, the most important of which are memoirs on the flow of viscous liquids, and on the propagation of sound in cylindrical conduits of great length. In this last work, he was associated with M. Violle, a Member of the Institut de France.

This then was the man who by every right—as scholar, investigator, engineer, and President of the Société Technique—took his position as the head and conductor of the proceedings of this the first International Gas Congress. In his demeanour throughout, he exhibited a coolness, gravity, and proper conception of his duties which fitted his dignified position and the occasion. As soon as the hall was filled, he was on his feet, the little bell again tinkled, and the hub-bub caused by numerous voices and moving feet quickly subsided and quietness reigned, but only for a moment. The promiscuous assembly of gas engineers of nearly a dozen countries recognized that before them stood the man who had been the active spirit in bringing them together, and with one accord they blended their voices in hearty greeting, which caused M. Vautier's ordinarily demure countenance to relax with the liveliest gratification. Silence was again restored, and a multitude of faces were expectantly upturned to the President. M. Vautier had prepared his Inaugural Address; and, presumably in view of the vast amount of matter which had to be dealt with within the three days allotted to the sittings, he had kept his oration within reasonable bounds. Yet before such an audience, and with such an opportunity, it would have been pardonable if he had entered with freedom into the subjects of which he is a master, and absorbed a greater amount of time; but he refrained. An indication of the lines upon which the address ran is given in the *résumé* of the technical proceedings which follows this review. The composition and subject-matter of the address were enthusiastically approved; but having honoured the President to this extent, something like a third of the delegates unceremoniously made their exit from the hall, and many of them during the sittings did not again see its interior—in fact, the main design of their visit to Paris was forgotten in the seductive counter-attractions of the vast exhibition and the beautiful weather. So that, from this point (although there was always a very fair attendance, and many were punctilious and observant in their following of the proceedings), the numbers present rose and fell hour by hour with a fickleness equal to the barometrical inconstancies which we have been experiencing at home during this summer.

Again the bell rang, and again order was restored; and the President called upon Dr. H. Bunte, of Carlsruhe, to read the first paper, on "Incandescent Gas Lighting." Revered by all gas men not only for his great erudition and research in gas technics, but for his innate personal charms, his appearance on the platform was signalized by a spontaneous greeting which few men could have expected to receive in an audience of such heterogeneity. But having introduced the papers, it is convenient here to turn for a moment from the course the proceedings took to say that the order in which the papers were disposed of was determined at the Committee meeting held on the preceding Saturday. In all there were 29 papers; and in the three days 26 of them were read, or their contents described—the other three being taken as read owing to the absence, temporary or otherwise, of their authors. In addition to the address, four papers were read on Monday morning, and six in the afternoon; four on Tuesday morning, and an equal number in the afternoon; five on Wednesday morning, and four in the afternoon. With such a bulk of material to present, little time could be wasted; and when there was any hesitancy in commencing discussions, after invitations had been addressed to the audience in (in some cases) two or three languages, it was taken that the Congress were in full agreement with the author, and the next paper was at once presented. In this way, the full programme, as settled by the Committee, was duly completed in the time allotted. On Dr. Bunte's paper there was no discussion; and the next paper by Messrs. Stoecklin, Rieder, et Cie. was taken in hand. It dealt with a kindred subject to that dwelt upon by Dr. Bunte—viz., "The Photometry of Incandescent Mantles;" and it culminated in the appointment of an International Committee who are charged with the duty of examining into, and establishing, a set of conditions for the regulation of the photometry of gas-mantles. On the Committee four English representatives have been nominated—Messrs. T. O. Paterson, J. W. Helps, C. C. Carpenter, and Professor Lewes. Germany, France, Belgium, Italy, Holland, Switzerland, and the United States are also to have representatives. Dr. Bunte and M. Vautier are among those already chosen to serve; and, as students of this particular subject, their assistance in arriving at definite conclusions will be invaluable. The wide separation of the Committee, and the inconvenience of leaving work and travelling long distances for consultative purposes, will, we fear, operate somewhat against this well-meant effort; but, with many others in the gas industry, we hope to see it bear good fruit. No words are required to emphasize the importance of the subject; the arguments in favour being all self-evident. If in any way the "JOURNAL" can be of service to the Committee, its columns are at their disposal. It may be mentioned that the Secretary to the Committee is M. Delahaye, of the Société Technique du Gaz.

During the Congress, the English party received many little tokens of the regard and friendliness of their French compeers; and it was with much appreciation that they heard M. Vautier call upon Mr. J. W. Helps, the President of the Institution of Gas Engineers, to succeed him in the chair before the third paper was read. This paper was by Mr. C. E. Brackenbury; and it dealt with a subject upon which the author can speak with some authority, and upon which he not long since made some remarks of sufficient effectiveness and poignancy to attract attention. But that is a bygone; and, while perhaps the chief disputants have not receded one jot from their positions, the Paris meeting has at least had the effect of bringing about their better acquaintance. This, however, is merely by the way. Mr. Brackenbury read his contribution on "Inclined Retorts" in French with a fluency which at once provoked the admiration and envy of his compatriots. The communication gave rise to a splendid discussion; and among others it brought into prominence the inventor of this system of carbonizing—M. Coze—who, on being announced, received the plaudits of the meeting. It is to be regretted that not a single English gas engineer spoke on the paper. The next paper was likewise related (as were the following two) to the carbonization of coal. M. Eichelbrenner was not present to read his contribution, which recorded his experiences on the question of "Independent Producers for Retort-Benches"—an interesting topic upon which, had it been open for debate, Mr. C. C. Carpenter might well have added his views. "The Measurement of High Temperatures" was the next subject to claim attention; and it was treated upon by Mr. Alten S. Miller, of New York. English speakers alone took part in the discussion, which was not altogether favourable to the instrument described.

The honour of directing the proceedings in the afternoon of Monday fell upon M. E. Beer, the President of the German Gas and Water Association. M. Euchène opened the sitting by discoursing as entertainingly as the subject would permit on "The Thermic Reactions in the Carbonization of Coal, and the Recording of High Temperatures." Contributions on water-gas questions came next from M. Sospizio and Herr A. Dicke. They were of a character which admitted of joint discussion, in which Mr. A. G. Glasgow, Dr. Leybold, M. Vautier, and M. Salomons were prominent. How to prevent naphthalene obstructions (which subject has been a standing dish ever since gas engineers first met in conference) was told by Dr. Bueb, of Dessau; and the same author dilated on the question of the manufacture of cyanides. A cognate subject was handled by Dr. A. Smits, of Amsterdam; but he was not present to read the paper. There was a good discussion—among the speakers on the first-named subject being Mr. J. P. Leather, who testified to his successful experience at Burnley; and on the latter M. Salomons and Mr. William Foulis subscribed useful information. Herr von Oechelhaeuser was also well in evidence on these and other subjects.

Tuesday morning saw England again honoured by the installation of Mr. T. O. Paterson, the President of the Gas Institute, in the central position on the platform. A splendid auditory had assembled to hear Mr. F. D. Marshall's paper on the "Mechanical Handling of Coal," which paper he had prepared in English. "For in spite of all temptations to belong to other nations, he remains an Englishman." (*Vide* the Centenary of Gas Lighting cartoon.) But very kindly, as the subject has already been dealt with by Mr. Marshall before the Institution of Gas Engineers, M. Krafft, of Naples, converted the paper into French, and himself read it to the meeting. Large

diagrams, some of which have seen service before on this side, were exposed to illustrate the plant described. We understand that it was Mr. Marshall's intention to contribute a paper on inclined retorts; but it was by the special request of the Committee that he dealt with the subject laid before the Congress. But when Mr. Marshall wants to relieve himself on the question of inclined retorts, there are the "JOURNAL" columns or one of the meetings of the Institution of Gas Engineers in or at which he could usefully do so. A companion paper to Mr. Marshall's was contributed by M. Louvel. It explained methods and plants adopted at the works of the Paris Gas Company for dealing with coke; and he went to great pains to let his audience gain a clear understanding of the plant. He was rewarded at the close by considerable applause. Again there was a change in the presidential chair; Mr. G. G. Ramsdell, of the American Gaslight Association, being desired by M. Vautier to take the honourable position. By this time, however, the attendance had appreciably thinned; and when Mr. Frederick H. Shelton, of Philadelphia, rose to explain the results of his experience and study of the question of "Reducing the Cost of Distribution by the Use of High Pressures," he had not such a splendid audience as his predecessors in the morning's programme. This was a pity, as the matter is one which bids fair to receive extended and serious attention. However, the author had the satisfaction of hearing a far better discussion on his effort than had many of the previous contributors to the proceedings. When the next paper was called, dealing with the subject of "Diminishing the Loss of Gas in Distribution," the author, Mr. P. H. Gibbons, also of Philadelphia, was absent; and consequently, Mr. Ramsdell gave place to M. Rothenbach, the President of the Swiss Gas and Water Association. Under his chairmanship, M. Weiss, of Zurich, described a paper, a large part of which consisted of tabular information concerning the operations of different works in Switzerland. Plans of the new gas-works at Zurich and of the works at Winterthur and Geneva were also explained. In connection with the Zurich works, M. Weiss asserted that they did not experience any trouble from the slipping of the coal charges in inclined retorts; and the point produced some interesting remarks. But some trouble was experienced in eliciting all the information which M. Weiss could have afforded on this and other points, if he could have comprehended the questions put to him in divers languages. Owing to this, not only with reference to this paper but others, there is no doubt that much that would have been valuable and instructive was lost during the Congress.

The President on Tuesday afternoon was M. Verstraeten, of the Belgian Society; and while he was in the chair there were some interesting communications. In M. Witz's contribution on "Gas-Engines and their Gas Supply" suppliers and users of gas-engines will derive some very serviceable knowledge; and the papers which followed, dealing with gas lighting from different aspects, will be found very informative. The authors were MM. Salzenberg, Himmel, and Lecomte. M. Lecomte is an earnest student of all matters affecting burners and lighting; and he delivered himself on this occasion (almost without a reference to his print) with a volubility, readiness, and a display of cognition which caused those to marvel who had not before heard him on his favourite topic.

During the afternoon, there was a little break in the proceedings, to enable M. Brix to give some particulars as to a special gas and water exhibition which it is proposed to hold in Vienna next year; and he expressed the hope that many of the members of the Congress would make an effort to be there. In a pamphlet dealing with the projected exhibition, it is stated that the Committee's idea is to celebrate the hundredth anniversary of the general use of gas for lighting purposes, and they have settled upon the city of Vienna as being the most suitable—first, because it is the place chosen for the next meeting of the German Gas and Water Association; secondly, because Vienna possesses one of the largest of recently constructed gas-works; and, lastly, but not least, because Vienna was so intimately associated with the invention of Dr. Auer von Welsbach.

Allied to some extent to the last subjects considered, was a proposal that a movement be set on foot among makers of gas-fittings with the object of producing more artistic patterns, "combining æsthetics with the advantages of incandescence by gas, account being taken of its lighting intensity, and of the smaller sizes of pipes which will henceforth suffice for obtaining a determined illuminating power." The Congress decided to invite Gas Associations to institute competitions on these lines, and to communicate to each other the results arrived at. Not long since, we saw some beautiful examples of artistic gas-fittings for incandescent lighting at the Royal Aquarium Exhibition; but at the same time there is no reason why competitions should not produce something of superior merit. Therefore we commend the suggestion of the Congress to our own Gas Associations.

The morning sitting on Wednesday contained a great deal of interest for English engineers. The honour of presiding was divided between Mr. W. M'Donald, the President of the Western (U.S.A.) Gas Association, and M. D. J. Cramer, of Rotterdam. A paper on "The Educational Fund of the American Gaslight Association," written by Mr. Alfred E. Forstall, of New York, was successful in drawing a good discussion, in which Mr. J. W. Helps and Mr. Charles Hunt commented upon the "Gas Manufacture" examinations of the City and Guilds of London Institute. Their remarks (the principal points in which we publish in our *résumé* of the technical proceedings) may induce the proper authorities to give some attention to this matter; for of our own knowledge, through verbal and written communications, there is not any very general satisfaction with the present examinations, even among candidates who have passed successfully through them. Succeeding Mr. Forstall's paper was one by M. Hedde, of Paris, on the question of interesting gas stokers in their work; and this gave Mr. C. E. Botley an opportunity of relating how he has accomplished the gaining of the interest of his men by a very simple process. The next paper was by M. Bouvier on "The Comparison of the Usual Methods of Lighting;" and incandescent lighting came out remarkably well. A question which has been troubling our own Gas Associations—viz., the standardizing of the threads of screws for gas-fittings—was introduced by M. J. Bengel, of Paris. France seems to be a great sufferer in respect of the variation of screw-threads; and the Congress decided to supplement the already difficult task with which the International Committee on the Photometry of Incandescent Burners are charged by deputing them to use their best efforts to bring about harmony in respect of screw-threads. Not the least interesting communication of the morning was a paper by M. Bolsius on "Prepayment Meters in Holland;" and, by figures, he disclosed the wisdom of pursuing an enlightened and liberal policy in connection with the system.

M. Krafft, the General Secretary of the Italian Gas Association, was the occupant of the chair on Wednesday afternoon; and at the commencement an extremely long paper on intensified lighting and cooking and heating by gas in Paris was summarized by M. Lévy. The brilliant examples of incandescent gas lighting which are now to be seen in Paris, through the energy and enterprise of the Paris Gas Company, invested the first part of the paper with considerable interest; and, in due course, we shall present our readers with a fuller notice than we are able to do in our *résumé* of the paper which appears elsewhere to-day. In two papers, M. Bigeard and M. Asselbergs expounded their views on the well-worn subject of consumers' wet and dry gas-meters; and the discussion which followed indicated that on the Continent opinion is as divided as to the relative merits of the two classes as it is in this country. If not instructive, the final paper, from the pen of M. Guichard, was interesting in that it described difficulties of a kind with which fortunately we are not so well acquainted in this country, in connection with the use of incandescent mantles for public lighting in Guayaquil, a town in Ecuador. Torrential rains and the invasion of insects are the two great enemies against which the mantles have to be protected.

The technical proceedings finished, there was a charming exchange of courtesies between M. Vautier on the part of the hosts and Dr. Bunte, as a chief among the visitors. In the success of this Congress, M. Vautier saw a happy augury for the future; and consequently he would not say "*adieu*" to his visitors, but only "*au revoir*." In appropriate phrase and words, which were punctuated by the approbation of all the visitors present, Dr. Bunte thanked M. Vautier and the Société Technique both for the cordiality with which they had received their visitors and the perfect arrangements they had made for the Congress. We may add the hope that these *réunions* will become a periodical institution.

There are a few matters of interest which occurred outside the Palais des Congrès to which reference must be made in order to complete this review of the week's proceedings. On Monday evening there was a reception of the delegates and their lady friends by the President and the Société Technique at the Hotel Continental; and it was a most brilliant affair. M. Vautier very courteously received his visitors, shaking hands with each, in the beautiful saloon in which the entertainment of the evening was provided. The programme of music and dance, which commenced about 9 o'clock, did not conclude much before midnight. The character of the music and dancing was charming, refined, and graceful. Refreshments were also served; and one and all left the hotel filled with the enjoyment of the evening, and impressed with the view that in Paris they know how to do these things, and that niggardliness is an unknown quantity when the pleasure of guests is in question.

During the midday adjournment on Tuesday, M. Vautier entertained the Honorary Presidents, members of the Organization Committee, Secretaries, and others to luncheon; and, in turn, the latter invited M. Vautier to dinner on Wednesday night at the Restaurant Voisin, Rue St. Honoré. M. Krafft, of the Italian Gas Association, was in the chair; and M. Vautier occupied the place of honour on his right. The greatest cordiality prevailed. Speeches were made by Mr. Marshall, Mr. Helps, Herr von Oechelhaeuser, Mr. W. T. Dunn, of the Gas Institute, a representative of the Paris Gas Company, and others. The value of such gatherings was pointed out as a means of bringing engineers more closely into personal contact, and also from an international point of view. Cordial thanks were expressed to the Société Technique and to the Paris Gas Company for their great hospitality. M. Vautier and others made appreciative speeches in response. M. Delahaye supplied a feature of the evening. In responding to the toast of his health, he gave the Sovereign or President of each country represented at the Congress.

On Tuesday evening, a visit was paid by members of the Congress to the show-rooms of the Paris Gas Company, 28, Rue du Quatre-Septembre, where a great variety of gas burners and

other apparatus were on view. The many forms of incandescent lighting exhibited were a striking feature; and a horizontal type of burner (the "Héliogène") with fringes of asbestos, claimed some attention. Perhaps most interesting of all was the Scott-Snell-Phillips self-intensifying lamp, of which details were given in the "JOURNAL" for Aug. 14. Gas engines and compressors, manufactured by the Company, were shown at work. The visitors were very generously entertained by their hosts.

Interesting mementoes of the Congress were photographically secured on Thursday morning. Near the Palais des Congrès, as many members of the Congress as could make it convenient to attend assembled; and a photograph was taken first of the President (M. Vautier) and all those who had been officially identified with him, and then of the whole body. In the afternoon, by invitation of the Directors of the Paris Gas Company, a number of the delegates proceeded, by saloon steamboats, to the Clichy Gas-Works. This event is noticed at greater length after the *résumé* of the technical proceedings.

Of course, during their stay in Paris the delegates spent their time liberally in viewing the Exhibition and the Gas Pavilion; and very greatly admired were the displays in the grounds of intensive incandescent lighting by the Paris Gas Company.

Gathered together under such genial circumstances, and having the strong position of the Société Technique du Gaz brought into comparison with their own respective conditions, it was not surprising that the members of the Institution of Gas Engineers and the Gas Institute should take the opportunity of informally talking over matters affecting the question of amalgamation; but no suggestion, so far as we can learn, was made which in any way has advanced the solution of the difficulty that blocks the way to the much-desired end.

By the end of the week, most of the English delegates had left Paris; and many of them have brought back recollections, which will be of an abiding character, of the kindly and courteous treatment of which they were the recipients at the hands of their colleagues across the Channel.

RÉSUMÉ OF THE TECHNICAL PROCEEDINGS.

To-day we give a *résumé* of the technical proceedings, and the text of two of the papers. In due course we shall publish the most interesting of the communications which were submitted to the Congress.

THE PRESIDENT'S ADDRESS.

The Congress was opened by the President with an address of some length. He called to mind the origin and general organization of the Congress, which was due principally to the Société Technique du Gaz. He traced the progress made in the gas industry generally during the latter part of the century, and more particularly since the year of the last Exhibition in Paris in 1889. He then proceeded to classify the papers which had been prepared for presentation, which, as already announced, cover a considerable amount of technical ground, commencing with the mechanical apparatus for handling coal and coke in gas-works, the carbonization of coal in inclined retorts, and the great utility of registering high temperatures by means of a pyrometer, and passing on to the means employed for purifying the gas, and taking out the cyanides by means of different processes. The various methods of burning illuminating gas came in for a large amount of consideration—the incandescent mantles of Dr. Auer von Welsbach receiving extended notice. Referring to this subject, the President alluded to the proposal to establish an International Commission for inquiring as to the advisability of universal conditions being adopted for testing the illuminating power of incandescent burners. The utility of employing water gas as an auxiliary to coal gas was also noticed; and the advantages gained from the use of such a gas for heating and cooking purposes was dwelt upon. The competition which illuminating gas had to face at the present time was mentioned; and the papers read at the recent Congress of Electricians were commented upon—the studies of Mrs. Ayrton and M. Nernst being especially mentioned. As regards examples of practical gas lighting, he directed attention to the interesting displays in the Exhibition itself—gas under pressure being consumed in the avenue from the Trocadéro to the Château d'Eau, and the Gas Pavilion being arranged so as to show the best possible means of using gas to the greatest advantage in various ways. The future of the gas industry, looked at from the rapid review made by the President, appeared to afford every confidence as to its general prosperity.

A commencement was then made with the technical papers—those dealt with on the first morning being entirely from other than French authors.

INCANDESCENT GAS LIGHTING.

The first paper taken was by Dr. H. Bunte, of Carlsruhe.* It dealt with a subject which was continually in prominence before the Congress, and which is indeed of paramount importance to the gas industry—that of the consumption of gas by incandescent burners. In opening, the author remarked that the success of incandescent lighting being removed beyond all doubt, the lighting power of gas was no longer an essential feature, but that it was of more importance to regard its calorific effect. There was consequently considerable interest shown in the actual quality of the mantles employed; and for this reason the German Association of Gas Engineers, on the invitation of the author, had examined the question, and arrived at certain results. The point considered was what constituted, under normal conditions, the effective working of an incandescent mantle. The reply showed that from a carefully made mantle, under a pressure of 30 mm. (1⅛ inches) of gas, and during 300 hours of combustion, an average intensity of 70 German or 56 English candles was given with a consumption of 120 litres of gas per hour. These results, compared with mantles made five years ago, showed a considerable amount of progress both as regards the economy of gas consumed and intensity of the lighting power developed. Whereas before, after 300 hours' service, the larger part of the mantles employed returned only 40 German or 32 English candle power (or a reduction of 45 per cent.), the present mantles, after the same length of time, showed a diminution which varied from only 12 to 20 per cent. The saving in money by the present mantles, compared with those formerly manufactured, was shown by the figures quoted of 3·43 c. per 100 German candles, as against a former 16·6 c. The author referred to the excellent lighting of the Champ de Mars, and congratulated the Paris Gas Company on the practical exhibition of incandescent lighting there offered to the public. Dr. Bunte then gave results from his own experiments with incandescent burners using various gases mixed with coal gas. While the latter *per se* gave a result of 70 German candles, when mixed with 20 per cent. of water gas the result was 105 candles. Thus, by the introduction and adoption of incandescent burners, there was open for the gas industry a very wide and active field of progress, which could not but prove exceedingly remunerative to those interested.

* A translation of this paper appears on p. 642.

THE PHOTOMETRY OF INCANDESCENT MANTLES.

The paper that followed also dealt with the subject of the photometry of incandescent gas-mantles, and was contributed by MM. Stoecklin, Rieder, et Cie., of Mulhouse. It was remarked that up to the present the means of measuring the illuminating power of incandescent gas-mantles was very vague, and the instructions given by the German Gas Societies were rather incomplete. It was suggested that it would be useful to determine the required conditions to establish a definite standard for comparison of the results from mantles. The particular points on which a decision was necessary were the mesh and height of the mantle, the height of the chimney, the pressure of the gas, and the consumption per hour. It was suggested by the authors that the pressure should be fixed at 40 mm. or 1·575 inches, the consumption at 110 litres, or 3·885 cubic feet, and the height of the mantle at 75 mm., or 2·953 inches.

In connection with the subject under review, the President proposed the nomination of an International Committee to establish rules to settle the best means of regulating the photometry of gas-mantles. After M. Lecomte, of Paris, had drawn attention to the difficulties in connection with the subject, and the mistakes to be guarded against, it was put to the meeting and carried—"That, considering the universal interest, both for manufacturers and consumers of gas, in the exact understanding of the best means of utilizing incandescent gas-burners, an International Committee be appointed to determine the rules to be followed in the photometrical observations of the same, and that the Committee of the Congress be authorized to proceed with the organization of such an International Committee."

It may be conveniently remarked here that, during the afternoon of the following day (Tuesday) a Committee meeting was held, when four representatives each from England, Germany, and France were nominated, and one from each of the other countries represented at the Congress. The English names suggested were: Messrs. Paterson, Helps, Carpenter, and Professor Lewes—Germany being represented by Dr. Bunte, M. Krüss (Hamburg), and Dr. Schæfer (Dessau), and another; while only two names were decided on at the time to represent France—those of the President (M. Vautier) and the Secretary (M. Delahaye). Belgium also had a representative suggested in M. Verstraeten, Italy in M. Krafft, Holland in M. van den Horst, and Switzerland in M. Weiss; while the representative of the United States is yet to be appointed. It was decided that the secretaryship should be confided to M. Delahaye, of the Société Technique du Gaz, and that the first meeting of the Committee should be held in Zurich, unless otherwise arranged.

Although the names forming this International Committee give every confidence for the adequate examination of the subject, and although it may be hoped that their efforts will prove sufficient to give an impetus to the systematic testing of incandescent gas lighting, there are many pitfalls in their way to be avoided; and it is to be desired that the result of their labours will not be diminished by lapse of time and extraneous causes, as is often the case with similar commissions of inquiry.

INCLINED RETORTS.

The first paper dealing with gas manufacturing plant was that on "Inclined Retorts," by Mr. C. E. Brackenbury, of London. At this stage, the President of the Institution of Gas Engineers (Mr. J. W. Helps) had the honour of succeeding the President in the chair. The paper by Mr. Brackenbury, which was given in the "JOURNAL" last week (p. 580), provoked an adequate discussion, led by M. Victor Krafft, of Naples. He

called in question certain figures cited in the paper; basing his remarks upon the total capital expenditure on this means of carbonizing as given in the author's introduction. He overlooked the fact that these were more or less round figures, which explained the slight divergencies in the cost of the make per 1000 cubic metres. M. Coze, of Rheims, supported the author; and M. Bermejo, of Malaga, described an installation of four arches of nine inclined retorts which he had put up, and which had proved eminently satisfactory. He confirmed also what Mr. Brackenbury had replied to M. Ancel, of Lyons, regarding the illuminating power of the gas being the same from inclined retorts as from horizontal ones. The Secretary of the Union des Gaz in London (Mr. F. W. Himing) followed, and pointed out the enormous advantage which such labour-saving appliances as inclined retorts gave to the management of gas-works in respect of the control of the stokers. Both M. Weiss, of Zurich, and M. Kohler, of Metz, described their respective installations, and confirmed generally the working results of inclined retorts as set forth in the paper. Mr. Brackenbury, in reply to the discussion, said the figures given by him were the average of a great number of installations actually at work.

Independent Producers for Retort-Benches.

The next paper on the programme was not read; the author, M. Eichelbrenner, of Paris, being absent. Its subject is an interesting one, and one to which some prominence has been given of late—viz., the building of producers independent of retort-arches. The author described the peculiar situation of his works at Billy-Montigny. The site of the works was undermined by colliery workings, and, in spite of well-made concrete foundations, the subsoil was found to give way continually. When rebuilding of the works was rendered necessary, the uneven settlement in the arches had therefore to be guarded against. For this reason, it was decided to separate the producers from the retort-arches and regenerators themselves. The former could be strongly built, and were little likely to be injured; while the latter might be easily damaged, and would be rendered useless by the slightest dislocation of the fire-clay blocks or the retorts. When the producers are separated from the carbonizing arches, it is an easy matter to shut off any arch that requires repairing, and the starting of another to replace it is much facilitated. The advantage of such a system consists principally in the fact that there is removed from the retort-house all accessory work, leaving it free for actual carbonizing operations; while at the same time the temperature of the subways in the retort-house is reduced, and the dust, &c., from clinkering is diminished. It makes possible, also, the use of an inferior quality of fuel, such as lignite and peat, which is of importance, considering the enhanced price of coal and coke. It further gives gas engineers greater freedom in the manipulating of the units of the retort-house. In water-logged soil, such as has often prevented the adoption of regenerative furnaces, the system is of utility in allowing generators to be placed on the most suitable site possible to be found. The principal objections urged against the arrangement described by the author are an increased first cost of the plant, and less economy in fuel, owing to the loss of heat by the travel of the producer gas. With regard to the latter, the author pointed out that it was of importance to distinguish between the difference of economy in weight and the economy in money. He found, with the average length of mains required to lead the producer gas to the regenerators, provided that ordinary care be taken, the loss of heat would be very slight. It was highly important to protect the producer-gas main as thoroughly as possible; and in the case illustrated, the sides were built in thick fire-clay, and banked all round with dry earth. The author's conclusion was that, as regards fuel consumed per cent. of coal carbonized, there was hardly any difference compared with that of the ordinary system. There was undoubtedly an increased cost of construction, which amounted to 8000 frs. or 9000 frs. (£320 to £360) on the ten arches constructed, or about 8 per cent. over the more usual arrangement. Remembering, however, the many advantages accruing from the adoption of separate generators, it was believed these were not purchased at too high a price.

Measurement of High Temperatures.

The next paper was an American one, by Mr. Alten S. Miller, on the "Measurement of High Temperatures." He described the instrument he had been testing for some time past, and which seemed suited to the measurement and recording of temperatures of above 1000° Fahr. The author submitted that the advantage of an instrument recording high temperatures accurately was self-evident; and at present it was necessary to depend largely on the eye and memory. By the instrument described (see p. 643), the author said the required heats could be ascertained, and the necessary instructions given to those in charge of the gas-making plant not to let them vary from the temperature desired. With such an instrument, Mr. Miller thought that interesting information could be obtained of the temperatures developed during the carbonization of coal. It was obviously important to ascertain accurately these temperatures in the manufacture of gas.

The Chairman (Mr. J. W. Helps) thanked the author for introducing the subject, and remarked that a reliable pyrometer was especially of value in the manufacture of water gas. Mr. J. P. Leather, of Burnley, did not think the instrument described by the author would really be a very accurate one. He (Mr. Leather) had obtained an instrument, with which he had not yet had much experience, invented by Professor Callandar, of Cambridge. This instrument, he explained, measured and recorded the electrical resistance of a platinum coil. It recorded on a scale of 1° Fahr. per millimetre. Consequently, the scale was a large one, and indicated practically to 1°. The superior limits of the instrument were something about 2000° Fahr. He quite believed the instrument to be a trustworthy one, both for low and high temperatures. It was remarked by Mr. A. G. Glasgow that an interesting point brought out in the communication was the fact that it was found impossible to calibrate the instruments scientifically—that was to say, by calculation. He referred to certain discrepancies, and then said that for practical purposes, it was, however, sufficient to know that this simple and ingenious instrument, when once calibrated, remained constantly correct. With reference to the use of the pyrometer, there was sometimes a disposition to think that, having once placed a pyrometer in a heated vessel, one was relieved of the care of constant watching and supervision. This view of the case had never appealed to him; for it was much more difficult to maintain a proper distribution of heat throughout a vessel of any size than to keep a practically constant temperature at any constant point. He did not, however, mean to belittle the advantages to be derived from the use of a pyrometer, continually measuring and recording high temperatures.

Thermic Reactions in the Carbonization of Coal, and the Recording of High Temperatures.

On re-assembling in the afternoon, the first paper taken was on the "Thermic Reactions in the Carbonization of Coal, and the Recording of High Temperatures." This was an "Official Paper of the Paris Gas Company," and was reported by M. Euchène. It was essentially one for study, running as it did into 180 pages, and containing innumerable tables of great value, and meriting minute examination. Apart from the length of the paper, respect for the enormous amount of work entailed in its compilation must, of necessity, have silenced any possible criticisms or remarks, except of a most general and unimportant kind, until time had allowed of its careful perusal. By this it is not meant in the slightest degree to detract from the valuable data and information thus given to the gas and chemical world by the Paris Gas Company. On the contrary, the warmest thanks are due to them for the magnitude and generosity of their intellectual gift. The paper is certainly one that will be referred to again and again in the future; and it may be expected to be regarded as a highly authoritative statement on a vastly important subject. The communication, as verbally given by M. Euchène, partook of the nature of a lecture, illustrated as it was by practical experiments. The first part dealt with investigations into the varying caloric conditions involved in the carbonizing of coal; while the second part treated, naturally enough, with the different ways and means of determining high temperatures. In the introduction, there was noted the difference in the point of view of the practical gas man who wishes to obtain merely the requisite heat for carbonizing by the smallest expenditure of fuel, and that of the scientific investigator who, ignoring the variations in the character of the plant employed, knows that the amount of heat required for decomposing a given quantity of coal is invariable. There followed an examination of the thermic developments and the loss experienced in distillation; and many valuable comparisons were made between the different qualities of coal, and between the results obtained, for instance, from the Siemens furnace and an ordinary one. Room for further investigations on similar lines was illimitable; and the opinion was expressed that the gas industry could not but profit by all that was attempted in this direction, because it was now confronted by rival industries, both young and eager, against which it must fight with all the arms of modern science. There was no discussion on the paper.

Water-Gas Questions.

The next paper taken was by M. Henri Sospizio; and it was on the subject of carburetted water gas, and its use in coal-gas works. At this stage, M. Beer, of the German Association of Gas and Water Managers, was installed in the chair. It is to be regretted that M. Sospizio did not in his paper make the most of his opportunities. It would have been of considerable interest (as foreshadowed in the "Journal" for the 28th ult.) to know how carburetted water gas could be beneficially adopted when hampered by enormous customs duties on the import of the oil required. Instead of dealing with this question fully, the author contented himself with giving merely a historical and recapitulated account of present water-gas processes. The author referred to the generally increasing importance of producing a gas of heating quality, rather than one for illumination—at all events, during certain hours of the day. It was also essential to make gas and sell it as cheaply as possible; and the production of it should therefore be more perfect than was at present the case, when only 16 per cent. of the coal was gasified, whereas with certain processes it was possible to obtain 60 per cent., or nearly 85 per cent. of the heating power from the coal. After referring, with patriotic satisfaction, to the work of Felix Fontana, the author proceeded to classify in two categories water-gas apparatus—the first, that in which water gas only is produced, being carburetted separately; and the second, that in which

the water gas is carburetted directly in the plant used for its production. As illustrating the former, the apparatus of Strache and that of Dellwik-Fleischer was described, and the composition of the gases made was given. In the latter class, the apparatus of Messrs. Humphreys and Glasgow, the Economical Gas Apparatus Construction Company, and Messrs. Cutler was mentioned. The description and the figures given in connection with these plants were merely a repetition of what has already been fully described, and are generally well known—indeed, the paper does not contain anything in the way of novelty. A compliment is paid to England for the severity of its hygienic rules as applied to carburetted water gas; but the observations on this point were only what Professor Lewes had already said in his report on the subject to the Corporation of Birkenhead. Apart from a solitary sentence in which the author remarks upon the customs duties which have prevented the general European adoption of water gas, and the advisability of the Governments concerned showing their wisdom by modifying these, he does not refer in any way to the particular point of view which one would have thought, from his position as Engineer of the Trieste Municipal Gas-Works, would have especially appealed to him.

Taken in conjunction with the preceding paper was one, under the title of "A Note on the Water-Gas System of Dellwik-Fleischer," by Herr H. Dicke, of Frankfort-on-Main. In comparison with the other paper, it had the virtue of brevity; but it was perhaps rather too detailed in mentioning the various uses to which the process had been applied. The author followed rather closely the information on this system already given to the gas profession by Professor Lewes. The water gas produced on this method was practically identical with that obtained by similar processes. These, however, the author said, raised only 2473 calories per kilo. of carbon, as compared with 8080 calories from the Dellwik-Fleischer generators—the quantity of heat usable for water gas being three times as great as formerly. Twenty-five per cent. of this gas had been mixed with that from the carbonization of coal, with the advantage that the quantity of coal carbonized was reduced, and considerable economy was secured. There were three different methods of mixing the gas—firstly, by storing the water gas in a separate holder, and mixing it with the coal gas after purification, and carburetting it as required either at the inlet or the outlet of the main holders; secondly, storing the benzolized water gas in its separate holder; and, thirdly, leading the uncarburetted water gas from its gas-holder into the hydraulic main or the condensing apparatus. The last method was found more than usually advantageous, owing to the coal gas taking up part of the benzol from the coal-gas tar; thereby effecting an economy in the benzol used. Such was the process as it was adopted at Königsberg—the first town to install a Dellwik-Fleischer apparatus.

For the purpose of discussion, the two water-gas papers by M. Sospizio and Herr Dicke were taken together. M. Bigeard remarked on the great utility there would be, as far as France was concerned, in employing such water gas when there were great difficulties in the way of procuring coal at reasonable prices. Mr. Glasgow entered at some length into the question; his remarks being directed more particularly to M. Sospizio's paper, and only touching lightly that of Herr Dicke. His criticism hardly bears upon the *résumé* that we have given; and therefore when the paper is published *in extenso*, we will take the opportunity of appending the full note of his remarks. He complimented M. Sospizio upon the fine qualities of style and thought reflected in the paper; but he regretted his inability to accept some of the most important figures presented therein. Having had to enter into the question of the adoption of water-gas apparatus, Dr. Leybold, of Hamburg, confirmed the figures of Mr. Glasgow; and he stated that, after careful consideration, he had adopted the apparatus of Messrs. Humphreys and Glasgow in preference to any other. He found that the guarantees given had been absolutely realized in practical working. He had decided upon the adoption of the Humphreys-Glasgow plant after seeing the Dellwik-Fleischer apparatus at Warstein with Herr Dicke, and after visiting England. It was found preferable, at Hamburg, to measure and store the water gas separately, and afterwards to lead it to the hydraulic main or elsewhere as desired. The ordinary proportion of water gas used was 20 per cent.; and it was found that the Auer and other like burners gave even better results with such a mixture than with coal gas by itself. In some subsequent remarks by Dr. Leybold (which were translated from the German into French by M. Bouvier), he stated that, of necessity, only German oil was used in the plants. The attempts to reduce the customs duty in Austria and Belgium had proved successful; and there was the curious result that oil could pass through Germany for use in Belgium, but could not be stopped *en route* for supplying the water-gas plants in the country. He was of opinion that, notwithstanding the recent increased price of oil, the accessory advantages of water-gas manufacture fully compensated for the outlay. M. Vautier seemed to think that some were in favour of superseding the distribution of coal gas altogether by water gas; and he did not believe that the manufacture of the latter would prove less costly than the former. It was also to be remembered that with water gas there were no bye-products, which were of such great consequence from the gas manager's point of view. M. Salomons, of Brussels, corrected the idea that it was intended to advocate the total substitution by water gas of that from coal; but he recommended the adoption of water-gas manufacture as an excellent means of meeting strike difficulties, in addition to its other advantages.

Naphthalene Obstructions—The Manufacture of Cyanides.

There then followed two papers by Dr. J. Bueb, of Dessau, which, as in the preceding case, were taken together for facilitating discussion. The first one was on the means to adopt for preventing stoppages from naphthalene. The author remarked that all attempts hitherto in this direction had been to the removal of naphthalene deposits already formed by mixing with the gas vapours of xylol on the system of Bunte and Eitner. The process brought forward by the author was one used at Dessau, which extracted naphthalene from the gas in a very simple and cheap way. The principle was to lead the gas to the outlet of a Pelouze and Audouin condenser into contact with a tar oil. Such an oil has the property of dissolving, according to its temperature, some 25 per cent. of its weight of naphthalene. It also, of course, absorbs a certain quantity of hydrocarbons; and the loss in the illuminating power of the gas that is thereby made is recouped by carburetting it afterwards with benzol. Two or three compartments of a "Standard" washer can conveniently be used, not only to extract the naphthalene, but at the same time for the absorption of cyanides.

This led up to the second paper by Dr. Bueb, on the manufacture of cyanides in gas-works. He mentioned the English practice on this subject. The main idea of the process described consisted in treating the gas with a concentrated solution of sulphate of iron. Thus was formed a salt of ferrocyanide of ammonia. The cyanogen in this case is also taken out in two or three of the compartments of a "Standard" washer; and there is the great advantage that this bye-product is obtained in a saleable form. The means described differed from all preceding processes, inasmuch as the ammonia in the gas was used for the taking out of the cyanides, whereby the simplicity of the system was increased. The manipulation of the arrangement could be undertaken by an ordinary workman. To some extent, the sulphuretted hydrogen from the gas was abstracted at the same time. It was further found that meter drums and gasholder sheets were not attacked in the same way as formerly—no doubt owing to the thorough abstraction of the hydrocyanic acid. The author stated that actual experience showed that English coals contained more cyanogen than others; and in a works where only English coals were carbonized, the amount of cyanogen obtained would correspond to 7·4 grains of yellow prussiate per cubic metre of gas. The coal used in France would give from 4 to 5 grains, and Silician coal perhaps 6 grains.

The next paper was by Dr. A. Smits, of Amsterdam, on the absorption of hydrocyanic acid by gas; introducing the question of the progress that has been made in the manufacture of gas as regards the production of yellow prussiate of potash by liquid means. In the absence of the author, the paper was not read; but it serves as a supplement to the preceding communications of Dr. Bueb. The author remarks that it is singular that it has been considered necessary to purify coal gas from its ammonia before treating it with carbonate of potassium, with the iron salt in solution for the absorption of hydrocyanic acid. He proceeds to give good reasons for holding such an erroneous belief, and describes the means by which he came to find out this fallacy. Quite independently, he came to the conclusions already arrived at by Dr. Bueb at Dessau. The net result of the progress made on this subject was, according to Dr. Smits, that by the dried process one can absorb only 50 per cent. of the cyanogen; whereas by the adoption of the liquid system, about 80 per cent., and even more, can be obtained.

All these papers being analogous, there was a general discussion. Herr Oechelhaeuser described how he had struggled against the two enemies of naphthalene and cyanogen; and then M. Salomons gave a description of the principal processes employed in England in connection with the recovery of cyanogen, and the more or less "secret process" adopted at Beckton, of which mention has been made in the "Journal."* Mr. J. P. Leather, of Burnley, offered a few remarks on the naphthalene paper of Dr. Bueb, because he had studied the question independently of him, and had arrived at similar conclusions. He had been some time washing the gas at the works under his charge, to extract the naphthalene, and was at present removing from the gas 10 to 15 grains per 100 cubic feet—250 to 300 milligrammes per cubic metre. If the gas was first cooled below 20° C., this was quite sufficient to prevent all deposits of naphthalene on the works and in the distributing-mains. With the method described by Dr. Bueb, there was no longer need for anyone to be troubled with naphthalene stoppages. Mr. William Foulis mentioned that at the Glasgow Gas-Works they had been practically, and on a considerable scale, extracting cyanogen from the gas in the form of ferrocyanide of sodium; and the process had been carried on with considerable success. There were two methods that he knew of in use in England—one, the process which they had adopted at Glasgow. This was the passing of the gas into a separate scrubber, in which there was a solution of an alkali (potash of soda). In this solution was kept suspended an iron salt. What they did use was a carbonate of iron in a very fine state of sub-division, which was, by

* See "Journal," Vol. LXXIV., p. 293.

mechanical means, kept in a thorough admixture with the alkaline liquor, so that the whole was utilized in the formation of ferrocyanide. The other process was the one which he believed was in use at the Beckton Gas-Works on a very large scale. In this, the cyanogen was extracted by adding a solution of sulphate of iron to the liquor in the ammonia scrubbers. From the experience he had had, he certainly preferred to treat the gas for the extraction of cyanogen in a separate scrubber. Cyanide of ammonia was not of commercial value in any large quantity, but must be converted into a ferrocyanide of sodium or potassium before it became saleable; and if they could make this directly, without having to convert it from ferrocyanide of ammonia, it seemed the most advantageous system to adopt. They wanted to get an article that could be sold in a crude condition to chemists, who worked it up into the final products, because he did not believe the making of cyanide of potassium or sodium was a process that gas manufacturers ought to take up at all. It was sufficient for them to make the crude material, and sell it to manufacturers, who were much more competent to work it up than were gas manufacturers. By the first-mentioned process, they had no difficulty in extracting the whole of the cyanogen contained in the gas. The temperature at which the coal was carbonized affected very largely the yield of cyanogen. The higher the heats, the greater the amount of cyanogen.

The Mechanical Handling of Coal.

The first paper on Tuesday morning was by Mr. Frederick D. Marshall, of Copenhagen, on the "Mechanical Handling of Coal." Before it was read, Mr. T. O. Paterson, the President of the Gas Institute, was invited to take the presidential chair. Mr. Marshall, speaking in English, apologized for having served up what was really a *réchauffé* of what had gone before. He had had the honour of presenting papers on the subject before the Institution of Gas Engineers; but the matter was of such universal interest that he thought it would be acceptable at this international gathering of gas engineers. The installation had been at work now for five years, with great success. He was very much obliged to M. Krafft, of Naples, for having translated the paper into French at a moment's notice. M. Krafft then read the paper, which described the plant at the Frederiksberg works of the Danish Gas Company, at Copenhagen. It was made up of two distinct parts—first, the discharging into the coal-sheds of boats bringing coal into the port of Copenhagen; and, secondly, the handling from the port of the amount of material required per day. The first operation was carried out by means of six steam-cranes and boom trucks, which deposited the coal into tanks, from whence small waggons conveyed it to the three stores, each of which contained about 10,000 tons. The outer walls of the stores were constructed in Monier cement work, resting on substantial red-brick foundations; the internal division walls were of timber. The second operation was effected by trains of ten to fourteen waggons of 10 tons each. The trucks, which were discharged through the bottom, emptied their coal into a hopper, from which it was elevated and conveyed to the stores above the inclined retorts by band conveyors. Only two men were required in the handling of 120 tons. The cost of the installation at the port amounted to £55,000; and that at the coal-stores and the apparatus at the works, to £3500. The cost per ton of coal into the hoppers above the arches came out at 2·44d. Before concluding the paper, the writer wished to show his appreciation of the work of others in the same direction. Mention was therefore made of Herr Possehl's splendid system at Hamburg; and the work of Messrs. Graham, Morton, and Co. was also noticed.

Coke-Handling Plant at the Works of the Paris Gas Company.

A paper by M. Louvel, dealing in considerable detail with the mechanical arrangements for handling coke at the works of the Paris Gas Company, was taken in connection with the foregoing contribution. The author showed various models of the apparatus employed in Paris, some of which possessed considerable mechanical ingenuity. M. Louvel remarked on the humanitarian aspect of dealing mechanically with the manipulation of coke, which, in the case of the Paris Gas Company, amounts to something like 750,000 tons per annum. Among other novelties described, were an apparatus for raising sacks at the rate of 400 per hour, and from which they could be easily lifted by the men employed; a sack conveyor of 100 metres in length, and of an elevation of 20 metres; and an admirable service of tip-waggons which throw the coke on the heap as required. The paper was well illustrated by models, diagrams, and photographs.

The Reduction of the Cost of Distribution by the Use of High Pressures.

As the next paper to be taken was an American one, on the request of M. Vautier, Mr. G. G. Ramsdell, the President of the American Gaslight Association, occupied the chair. The paper was one by Mr. Frederick H. Shelton, of Philadelphia, on the reduction of the cost of distribution by the use of high pressures. It was printed both in English and French, and was read in the former. The author remarked upon the increased yield and efficiency of retort-benches, and on the improvement that has taken place of late in the manufacturing departments of gas-works, in contradistinction to the lack of progress in the distribution of gas, which is now practically what it was even twenty years ago and more. The consumption of gas had increased in enormous proportions; and there was necessity for ever enlarging the diameters of mains, which were more and more difficult to place owing to the many services for which room had to be found beneath the roadways. He suggested it would be advantageous, instead of placing larger pipes, to increase very considerably the pressure at which illuminating gas was distributed. The existing mains could be made to deliver from ten to fifteen times the volume of gas now carried; and would this not prove to cheapen the cost of distribution? The author did not deal with the financial aspect of his proposal, as he assumed the saving to be so obvious that the exact degree of gain was not the first consideration. Instead, he described several installations, on such lines as he suggested, that had been carried out in the United States with apparently satisfactory results. The chief points requiring attention were durability of the street mains and thoroughly tight joints, reliable machinery for compressing and pumping, proper regulating main governors and service-regulators reducing the high to the low pressure, and other appliances for the general safety of the working. He described how the towns of Phœnixville and Royersford, near Philadelphia, each with a gas-works, were connected together by a high-pressure main, so that the smaller gas plant of the two could be put out of action. At the end of this main, some 5 miles in length, two governors were placed for the reduction of several pounds pressure to that in the existing mains—viz., 2·7 inches. Thus gas was supplied to a town a considerable distance off without the use of a gasholder or storage plant. Sceptics predicted that the candle power of the gas would be reduced, that the governors would not prove reliable, and that there would be many dangers and inconveniences from the adoption of such a high pressure; but the author stated that none of these forecasts proved correct, although it may be remarked that no close photometrical observations have been made. The author illustrated the various appliances employed for safety-seals, house-service regulators, meters, and gauges. He thinks, from this rough beginning of high-pressure distribution, further developments may take place.

Considerable discussion followed the reading of this paper. Dr. Leybold remarked that wrought-iron pipes placed under the roadway where electrical tramways were running were deteriorated in a few months by the return current; and a considerable number of leaks and other inconveniences were caused thereby to the gas-mains. M. Marchal, of Nantes, confirmed this, and called to mind a paper written in 1893, by M. Gaston Gautier, on the subject of electrolysis. Mr. Charles Hunt, of Birmingham, was desirous of knowing whether Mr. Shelton had considered how far the saving to be effected in the cost of mains and services was counterbalanced by the increased cost of regulators needed for all consumers, and of high-pressure meters, assuming these to be also necessary. An inquiry was made by Mr. J. A. Norcross as to whether Mr. Shelton had seen this high-pressure system experimented with in the case of coal gas. In looking through the paper, he noticed the towns mentioned were using carburetted water gas or oil gas of some description. The means suggested by the author were very practical and simple, and would reduce the capital cost; but if it was necessary to use carburetted water gas in order to adopt the high-pressure system, it might in some instances prevent people trying it. There was a singular point in regard to that in the case of coal gas. The new methods of manufacture, such as inclined retorts and machine stoking, involved an increasing capital cost, which was the reverse of the object of Mr. Shelton's high-pressure system. If coal gas, on account of naphthalene depositing in small pipes, could not be used with the high-pressure system, then it necessitated the employment of carburetted water gas, which, instead of increasing the capital cost of the producing plant, reduced the outlay. So that in such a case the adoption of a capital saving in the distribution system also required the adoption of a capital saving in producing plant. Mr. S. Simmelkjör, of London, stated that about nine years ago he had occasion to provide a supply to a quarter of Buenos Ayres which had sprung up about 7 kilometres from the gas-works. He decided to use a high-pressure main, without a gasholder; but he determined to employ regulators on the way to the different consumers, and so on. This did not answer; and there was continual bother about it. He therefore decided to erect a gasholder, and had done away altogether with district regulators. He pumped the gas up to the holder, and from there distributed it to the district at the usual pressure of 1½ to 2 inches. He did not find any difference in the expenditure, and was satisfied the gasholder was the better plan. Replying, Mr. Shelton said the additional cost of taking care of each consumer was about $2 to $3; but then he had no additional outlay for pipes. The idea was to keep down capital investment, and get good results for half the cost of the ordinary amount of capital involved. The operating cost was perhaps ½d. or 1d. per 1000 cubic feet. He would not hesitate to compress coal gas just as easily and satisfactorily as he would water gas. Mr. Norcross seemed apprehensive of naphthalene troubles with coal gas. Some of the greatest troubles he had seen in this way had come from water-gas works. No inconvenience had been experienced in regard to electrolysis; and in this connection, he referred to the satisfactory experience of the natural gas people of America,

One engineer connected with the natural gas distribution in the Pittsburg area had stated that, after twenty years' experience, he liked nothing better than wrought-iron pipes, and that they lasted a great deal longer than their enemies said they would.

Diminishing Loss of Gas in Distribution.

The paper by Mr. P. H. Gibbons, of Philadelphia, entitled "In What Manner can the Normal Loss of Gas in Distribution be Most Largely Diminished?" was, in the temporary absence of the author, taken as read. The great importance of reducing as much as possible loss of gas in the distributing-mains was emphasized. The choosing of a suitable site for a gas-works affected this; and the different causes of leakage, not only in the gas apparatus on the works, but in the joints of the mains and service-pipes in the town, were dealt with. There is nothing calling for great attention in the paper, as it dealt with a large number of small details. One point may be noted, and that was a suggestion that in the laying of pipes a record should be kept of the kind of earth in which they were embedded, as it was well known that the character of the soil had a considerable effect on the life of the pipes. For instance, pipes which had been laid for forty years were still found in a fair state of preservation; while others after a lapse of only ten years were utterly useless.

Statistical and other Information Concerning Swiss Gas-Works.

The chair having been vacated by Mr. Ramsdell in favour of M. Rothenbach, President of the Swiss Gas and Water Association, statistical information regarding the operations of different gas-works in Switzerland was presented by the Swiss Society. These were of some interest to those connected with the working of Continental gas undertakings, and were ably summarized by M. Weiss, of Zurich. The general success of the works concerned was attributed to the reductions in the price of gas, to facilities given for its use for heating, the free fixing of service-pipes up to the meter, and in many cases no meter charges. In consequence of increasing demands, many expenses had had to be incurred at the Zurich and other gas-works. Inclined retorts, automatic handling of coal, De Brouwer coke-conveyors, and fuel boilers for burning dust were among the improvements adopted. It was mentioned that wear and tear expenses in connection with conveying plant for inclined retorts were found to be very small. As the motive force, electrical energy was used —5-horse power being required for every 15 tons hour. Several interesting drawings of portions of the Zurich plant were exposed for the information of those present.

In the discussion, Mr. Marshall said he understood that the transporter at the Zurich works was on the shuttle principle; and he inquired whether the wear and tear on the shuttle was not great. Also whether M. Weiss found that the shuttle, by jumping the coal forward, did not reduce it to fine particles, because it had been his (Mr. Marshall's) experience that all the trouble with the slipping of coal in inclined retorts was due to its fineness, and not so much to any special coal. Owing to the exigencies of the language, it was not found easy to continue the discussion at this stage, as English, French, and German were being used somewhat indiscriminately. After explanations, however, M. Weiss made it clear that slipping of the coal during carbonization was altogether unknown at Zurich, and that the coal used being German, and having been previously washed, there was little or no coal dust. Both Herr von Oechelhaeuser and M. Godinet, who had visited the works at Zurich, confirmed the regular working, and the small amount of coal dust made by the conveying apparatus. They also remarked upon the moderate amount of electrical force required for driving the plant. M. Rothenbach (*fils*) having added a few remarks, Mr. Marshall again observed that he understood the German coals were all washed; and this would account very much for what he had mentioned. But, all the same, he should like to ask M. Weiss whether he had his coal specially prepared, because it seemed so strange that in England, Germany, and Denmark gas engineers should experience the trouble of the coal running down to the mouthpieces, while another man with the same apparatus should be perfectly free from this nuisance. Mr. Helps, who said he had visited Zurich, complimented M. Weiss on the general arrangement of the works, which he considered were splendidly designed. But he thought that the amount of capital that had been spent there must be something enormous. M. Vautier asked Mr. Marshall to give a description of the conveyor he used into and out of the coal-stores. Complying with the request, Mr. Marshall stated that the conveyors were made of ordinary cotton bands about $\frac{1}{4}$ inch thick, and perhaps 18 inches wide. These bands were started in 1894. Up to date, they had conveyed 240,000 tons of coal; and the wear and tear was practically *nil*. He believed the bands would go on for another three years without any repairs whatever; and when they did require repairing, it would only be a question of piecing in small strips. The bands would then be almost as good as new. The installation, as he had said, had been working since 1894; and he supposed the repairs to the machinery, and on the installation generally, had not cost 1000 marks in the six years.

Gas-Engines and their Gas Supply.

On reassembling on Tuesday afternoon, M. Verstraeten, the President of the Belgian Association, was called upon to preside. M. Aime Witz, of Lille, opened the proceedings with a paper on "Gas-Engines and their Gas Supply." He remarked that gas-engines possessed one general merit—viz., that they could be accommodated to all kinds of gas—the richest as well as the poorest, from acetylene down to blast-furnace gases. A gas-engine of 1000-horse power—previously a vague dream of engineers—was now an accomplished reality; and such a motor was to be seen in the exhibition in the Belgian section, by the John Cockerill de Seraing Society. Its cylinder was 1·300 metre diameter, and a 1·400 metre stroke. It developed from 560 to 670 effective horse power with blast-furnace gas of 985 calories per cubic metre. The practical utility of using blast-furnace gases for gas-engines was placed beyond all doubt; and similar success might be expected in employing gas from coke-ovens. Dowson, Gerdie, Lencauchez, Deutz, Pierson, Fichet et Heurtey, Bénier, and others, had contributed to this triumph of the gas-engine by their different systems of producer gases, of which some particulars were given. It was surprising that the Paris Gas Company in 1899 only sold $\frac{1}{33}$ of their production (or 3 per cent.) for the use of gas-engines; while in Germany there were certain works which sold not less than 17 per cent. of their gas for motive power. Acetylene gas had been tried for use in gas-engines; but it had not fulfilled expectations, notwithstanding that it gave 14,000 calories per cubic metre, comparing with 900 calories for blast-furnace gases. M. Lencauchez had shown that the thermic efficiency of gas-engines did not vary to any extent with the richness of the gas used.

M. Marchal, of Nantes, commenced the discussion by complaining that, in the comparison of gases used for motive power, the price of coal gas was always exaggerated; while the price of producer gas was minimized. M. Witz remarked that the price of gas varied very much between one place and another, and that it was not easy to definitely state the exact value of each gas. Herr von Oechelhaeuser congratulated M. Witz on the work he had accomplished in this way. He himself wished the gas industry to consider favourably gas-engines using producer gas, because it reacted on the demand for coke. The President of the Union des Gaz in Paris (M. Salanson) had made experiments on gas-engines varying the richness of the explosive mixture. He had always found that the efficiency of the motor increased as the mixture became poorer. He thus confirmed, in part, the observations of the author on the efficiency of gas-engines for inferior quality gases.

Competitions for Artistic Patterns in Gas-Fittings.

Herr von Oechelhaeuser called attention to the above question, and submitted a resolution to the following effect, which was unanimously passed: "In view of the great importance attaching to the appliances used in the consumption of gas for lighting purposes, this Congress consider it to be absolutely necessary that a movement should be set on foot among makers of these and like appliances in all countries, with the object of producing chandeliers, brackets, &c., of more artistic patterns, combining æsthetics with the advantages of incandescence by gas, account being taken of its lighting intensity, and of the smaller sizes of pipes which will henceforth suffice for obtaining a determined illuminating power. The Congress therefore invite the various Associations of Gas Managers to institute competitions, on the lines above indicated, with prizes adequate in number and value, and to communicate to each other the results arrived at in their respective countries."

"La Lumière Boule."

The remaining papers taken during Tuesday afternoon dealt with different burners for illuminating gas. The first one was entitled "La Lumière Boule," and was written by Herr Salzenberg, of Crefeld. The title—"The Globe of Light"—was taken from the name given to the particular process of the author. He called to mind the different efforts put forth for increasing the intensity of the gas or air, the principal systems of which were named and described. For his own arrangement, the author claimed certain advantages. First, on the point of economy; the consumption of gas being 1 litre per candle, including the gas for the compressor. He also claimed an exceedingly uniform diffusion; and the colour of the light he described as sunlight yellow. There were two types of the burner—the "Universal" and the "Standard." Incandescent gas-burners, with compressed air, did not, in his opinion, show better results than the ordinary Auer burner. Further, it was found almost impossible to regulate the two supplies of gas and air; while with the author's arrangement this regulation was very effectively accomplished.

M. Lecomte questioned the statements of the author of the paper, and the advantages accruing from compression—the difficulty being in obtaining the proper proportions of air and gas for the mantles.

Lighting High Gas-Lamps.

M. Himmel, of Tubingue, followed with a short paper on the "Automatic Lighting of High Gas-Lamps." By means of a complete model, the author made clear the clever mechanism adopted, whereby gas-flames at a height of 8 to 10 metres could be easily lighted and turned off from the ground. The arrangement described was to be seen close to the Palais des Congrès.

A fuller description of the arrangement will be given when we publish a translation of the paper.

Competitive Systems of Gas Lighting.

The concluding paper on Tuesday was one of considerable length, on "Competitive Systems of Gas Lighting" by M. A. Lecomte, of Paris. The author is a recognized authority on the subject, and has frequently contributed papers to the proceedings of the Société Technique du Gaz. He gave a *résumé* of the present paper, speaking first of experiments made as regards the heating power of various hydrocarbons, and their evaporation either heated or not. An injection of oxygen in the flame raised the temperature, and in certain cases its illuminating power; and it might be possible to obtain an efficiency without a mantle almost equal to that with incandescence. For obtaining a good illuminating effect from petroleum vapour, the high temperature of 300° C. was required, or double the temperature of volatilizing it. But it also caused trouble from choking up. The system shown in the Exhibition necessitated frequent cleaning, and the replacing of the small vaporizing-pipes every week. Alcohol had been tried in Germany for incandescent lighting; and a mixture of benzene with it gave very interesting results. A lamp had been brought out for burning this mixture, and was to be seen at the Gare de Thomery. At the close of the paper, M. Chevalet pointed out that the question of lighting by means of alcohol had been recently brought before the notice of the Congress of Applied Chemistry.

The Educational Fund of the American Gaslight Association—English Gas Engineers on the City and Guilds of London Institute Gas Manufacture Examinations.

On the third and last day, Mr. W. M'Donald, the President of the Western (U.S.A.) Gas Association, took the chair at the commencement of the proceedings.

The first paper was by Mr. Alfred E. Forstall, of New York, on "The History, Character, and Results of the 'Educational Fund' Created by the American Gaslight Association for the Professional Instruction of Employees in Gas-Works." The paper was presented in both French and English; but it was read in French to the meeting by M. Godinet. The origin of the fund referred to was due to Mr. Walton Clark, the President of the American Association in the year 1895. He desired to see systematic aid given to young workers in the gas industry, so that those wishful to improve their knowledge and position could have every assistance afforded them. There were no gas text-books, as such; and the only work of the kind proposed to be introduced was carried on by the City and Guilds of London Institute. The matter was taken up, and a Committee appointed; and in March, 1896, a class was started with a membership of 76. Four lists of questions were sent out every year, covering the practical duties of a gas superintendent. It was believed that from the answering of such questions the students would be familiarized with the books referred to, and that they would probably get the greatest good of all from the clear expression of their ideas in writing. Prizes were first of all given; but this idea was dropped, so that the average number of 100 students were kept together merely by a desire on their part for increasing the knowledge of their work. The author rightly remarks that it will not be necessary to labour the argument that so increasing the efficiency of young workers must prove eventually of value to the industry itself. He hoped that the example set by the Trustees of the Educational Fund would be followed with equal success in other countries.

The paper gave rise to a fairly good discussion; the first of the speakers being Herr von Oechelhaeuser. He prefaced his remarks with the observation that certain things might be very good in America, and yet prove the reverse in other countries. He then proceeded to describe what had been done at different places in Germany, and mentioned the report of the German Technical Commission held at Mayence during the present year. On the suggestion of M. Vautier, Mr. J. W. Helps gave some particulars of the working of the City and Guilds of London Institute, which had been referred to in the paper. This he did in English, which was very cleverly translated into French, sentence by sentence, by Mr. Walter B. Brady, the Assistant Secretary of the European Gas Company. It is unnecessary here to follow Mr. Helps's explanation; but towards the close of his remarks, he said it could be easily seen that the system had some weak points, especially in regard to the gas industry. Although Polytechnics and Educational Institutions were now rapidly growing in our country, it was not every town which, although it might possess a gas-works, was large enough to get sufficient students for a class in connection with the gas industry; and, therefore, those engaged on the gas-works in that town had no opportunity of getting the necessary instruction. It was in this connection that he could not help thinking that the plan drawn up and worked in America had much to commend it. Another point in connection with the Gas Manufacture Examinations was that the whole of the papers were set practically by one engineer, selected by the City and Guilds Institute. He could not help thinking that more value would be placed upon these examinations if the papers were set by some properly organized body of gas engineers; and it seemed to him that more value would then attach to the certificates awarded. From a competitor's point of view, and from the point of view of the manager, there was not the slightest doubt the plan that had been suggested had many advantages. Anyone who had had the trouble of selecting a competent foreman must know what a difficult matter it was. Sometimes they could get a good organizer—a good man who was able to look after his workmen—but he had no technical ability; and if they had some plan whereby general education could be given to the employees of a gas company, this difficulty would, he thought, be to a great extent overcome. It was impossible for Mr. Helps to clearly state his views in the disjointed fashion necessitated by the translation of his remarks. M. Vautier thanked Mr. Helps for the information he had given, which, he said, had interested him very much. He then himself supplied an account of the lectures given at Lyons to the men employed in the gas-works there. Mr. Charles Hunt, of Birmingham, as a former Examiner of the "Gas Manufacture" section of the City and Guilds of London Institute, had found that the whole of the students who presented themselves for examination were drawn from the employees of gas-works, or from industries immediately connected with them; and they bore little or no evidence of having attended classes specially designed for their instruction. The questions were invariably put to test their practical knowledge, and not their theoretical knowledge only. He thought it was to be deprecated that any attempt should be made to convert a practical examination into a theoretical one. Mr. Helps appeared to think that greater value would attach to these examinations if they were conducted by a body of engineers rather than by an individual. He quite agreed that, if the examinations were in the hands of a body, as in America—such as the Institution of Gas Engineers or the Gas Institute—they might possess greater value; but beyond this he was not prepared to go. He had had some experience of attempting to frame questions with a colleague, and he found this difficult enough. He thought it would be still more difficult to frame questions by means of a Board, and that it would inevitably devolve upon one person to set them. He went with Mr. Helps to this extent—that the certificates would be of greater value if given by the Institution rather than by the City and Guilds of London Institute. Mr. Ramsdell pointed out that, when the educational work was first taken up in America, it was placed in the hands of a Committee; and they found more or less difficulty in the matter of preparing the questions, and particularly in handling the answers. They could not note the progress of a certain individual where different engineers were taking his answers, nor could they give them their proper ratio of merit.

Interesting Stokers in their Work.

The next paper was a detailed account of the systems adopted in various gas-works for interesting the stokers in their retort-house work—the author being M. I. Hedde, of Paris. The importance of the question was first dwelt upon; and a well-deserved tribute was paid to the Société Technique, who, as long ago as 1877, instituted the prizes that are annually gives to deserving foremen and others engaged in French gas-works—see last week's "Journal," p. 583. They had also obtained from the Government medals of honour to be given to the most worthy servants of gas-works in France. The author's examination of the various methods adopted for interesting stokers in their work, was divided into three parts. The first dealt with the custom of giving small additions to salary for increased make of gas and economy of fuel; the second with the foundation of clubs and institutions; and the third with benefiting the workmen and their families in old age. The last part of the paper was taken up with the discussion of the various means described; and certain suggestions were made. The author strongly held the opinion that it was not enough to merely pay a stoker the amount of wages due to him from time to time, but that it was also wise to assure him of assistance during time of trouble.

There was considerable hesitation shown in commencing the discussion on the paper. Ultimately, however, M. Rieder, of Mulhouse, said no doubt the silence of the German members of the Congress was to be attributed to the fact that the Government had centralized their work in this respect. M. Krafft mentioned that at Naples they had tried the method of sharing among the stokers 25 c. per day for each man according to the proportion of gas made per retort. This was in addition to their wages of 3·50 frs. per day; and a meal was also served to the men at the works which they would not otherwise have. Mr. C. E. Botley, of Hastings, remarked that, like the last speaker, he had for some years encouraged the stokers by giving them an extra amount of money in consideration of the work they did. A certain amount of work was put for the men to do, and a certain quantity of gas to be made; and after they had done this they were paid 2½d. for every 1000 cubic feet produced beyond the regular quantity. This was divided among the whole of the stokers. They had worked on this plan for many years past, and it certainly had resulted in them getting better work. He also found that, if the men got a bad fireman or a bad stoker, they very soon called attention to it, because they lost their extra money. He spoke very highly of the way his men had taken the matter up, and said undoubtedly it was a great assistance in securing good men.

Comparison of the Usual Methods of Lighting.

M. D. J. Cramer, jun., of Rotterdam, occupied the chair for the remainder of the morning sitting. The paper which was

first taken under his presidency was by M. Bouvier, of Lyons, on "The Comparison of the Usual Methods of Lighting Explained by Diagrams." The author alluded to previous works on the subject which summarized, in addition to his own personal experience, experiments made by numerous specialists on the usual methods of lighting, so as to complete preceding papers presented to the Société Technique du Gaz. M. Bouvier sought to establish by means of diagrams a comparison between the principal means of illumination—how many litres of gas were necessary for an ordinary burner, an incandescent burner, by gas under pressure, &c., how much ordinary petroleum, and what electrical current ought to be consumed to obtain a given quantity of light. Several interesting tables of comparison were made from the point of view of the cost of the various illuminants—taking, for example, the town of Lyons. An ordinary burner for one carcel hour cost 2·5 c.; an Auer burner, 0·36 c.; incandescent gas under pressure, 0·2 c·; and acetylene, 1·5 c. The progress of incandescent gas lighting which was inaugurating the Twentieth Century was certainly, the author pointed out, one of the most salient features of the gas industry, and would no doubt contribute largely to its continued prosperity.

There was no comment on this paper; and the next one was immediately proceeded with. It discussed the question of

The Advisability of Standardizing the Threads of Screws for Gas-Fittings—A Reference to the Committee.

The author was M. J. Bengel, of Paris; and he stated that, at the commencement of the industry of gas apparatus and fittings, Paris was the only maker of such; and naturally there came to be adopted the Paris system of screw threads. At Lyons, very shortly afterwards, there sprang up a similar industry; and the manufacturers there, in turn, adopted their screws. This inconvenience had developed to a considerable extent with the growth of the work to be done; and at the present moment in the Lyons district alone there were no less than six different screws or threads adopted. In addition to this, in France, there were the Rouen screws, the Nantes, and many others. Therefore, he suggested that it might be advisable for the Société Technique to nominate a Commission to undertake the study of the question, and to adopt a certain number of threads for gas-fittings—and the fewer the better.

Discussing the question, M. Lacaze confirmed the variations as quoted by the author, and added that such differences not only varied with the locality, but even the same firm in different years manufactured different threads. Some time back the Paris Gas Company initiated a thread that they tried to make national under the title of the "Type Parisienne," in the hope that, after becoming national, it might possibly become international. Some useful work on similar lines was attempted in Holland in 1898. It was mentioned by Herr Silbermann, of Berlin, that German manufacturers had already endeavoured to standardize the pitch of the screws used for gas-fittings.

In connection with this question of the standardizing of threads, in the afternoon of the same day, the Congress unanimously adopted an expression of opinion which was conveyed in the following form: "Considering the interest involved in the interchangeability of apparatus used in the distribution and consumption of gas from the point of view of the gas consumers, the opinion is expressed that gas companies might take the initiative, in conjunction with the manufacturers of meters and gas-fittings, to arrive at the general adoption of a uniform thread for each type of apparatus; and the 'International Committee on the Photometry of Incandescent Burners' is deputed to unite the various discordances, so as to adopt a standard thread and to prepare a report to this end, which will be communicated to all those interested."

Prepayment Meters in Holland.

Time was approaching for the close of the morning sitting, when M. Bolsius, of Bois-le-Duc, commenced reading his paper on results obtained in Holland with prepayment meters. The number of members present at this stage reached the lowest point during the Congress—certainly not more than 50 then being in attendance. The paper, however, was a very conscientious and interesting one, containing a considerable amount of useful information on the subject. In his introduction, the author brought forward the claims of Minckelers in anticipation of Murdoch and Lebon for the discovery of illuminating coal gas. Proceeding, he said that within five years following the adoption of prepayment meters in Holland, out of about one hundred gas-works, both large and small, 43 had placed them at the disposal of their clients. From a summary of the figures for each of the works in question, it seemed that those adopting this means of paying for gas consumption were charged a fairly high price in consequence of the free installation of the apparatus required. By Jan. 1 this year there had been placed 27,785 prepayment meters, with an average annual consumption of more than 400 cubic metres each. After having reviewed the difficulties found in starting the system, principally in Amsterdam, it was recommended that the extra charge made should be fixed at 2 c. to 3 c. per cubic metre—say, 8d. per 1000 cubic feet. The gas-works at Amsterdam passed, on Aug. 10, 1898, from the control of the Imperial Continental Gas Association to that of the town; and there were on that date 915 prepayment meters in use. At the end of the same year, there were 934; and by the end of the following year, the number had increased to 1869. At the present time, installations were being made at the rate of about one hundred a week. A detailed description followed of the organization of the service at Amsterdam; and the author expressed the opinion that wise and liberal measures in the direction of the prepayment system proved of great benefit to a gas undertaking, and gave considerable advantages to the small householder at a reasonable cost, tending thereby to an amelioration of his social condition. The author acknowledged his indebtedness to Mr. George Livesey, of the South Metropolitan Gas Company, for figures which he had been good enough to supply to him; and the paper included figures referring to the working of the system by that Company.

M. Salomons, of Brussels, called in question several of the figures given by the author, and said that, on the first adoption of prepayment meters at Amsterdam a little before 1895, the additional charge mader epresented 5 per cent. on the price of the gas sold. M. Vautier asked what was the cost of the installation of such a meter. The author replied that it had been approximately 100 frs.; but to-day, owing to the increase of prices all round, it was rather more. M. Krafft, of Naples, said that in his town prepayment meters had rendered great service to the Company. They placed one free burner with each meter.

Intensified Lighting and Cooking and Heating by Gas in Paris.

On re-assembling in the afternoon, M. Krafft, the General Secretary of the Italian Gas Association, occupied the chair.

The third paper contributed by the Paris Gas Company to the Congress was proceeded with. It was divided into three parts, describing the intensive lighting in the Champ de Mars, and the heating and cooking apparatus adopted by the Company. This paper of 90 pages was ably summarized by M. Lévy. The Company, it was stated, had considered it would be advisable to give to the general public a practical example of the best means of street lighting; so they made arrangements for the illumination of part of the Exhibition of 1900, as they had previously done in 1889. A historical review was next given of the application of intensive burners for public lighting; and burners known under the names of the "Quatre-Septembre," "Schülke," and "Giroud," and the Auer burners, No. 1 giving 4 carcels from 80 litres of gas, and No. 2 6 carcels from 120 litres as adopted by the Company since 1893, were mentioned. After this, gas-burners under a pressure of 1·50 metres of water gave 1 carcel light with a consumption of 12 litres of gas. These burners, however, were unsatisfactory on account of the noise they made; and the mantles were not durable. The first Denayrouze burner of July, 1896, and the Welsbach model of 1898 were referred to. For the Exhibition the Paris Gas Company employ gas under pressure rather than air, so as to avoid the necessary services for the latter. They burn the gas under a pressure of 200 mm. in Bandsept burners, consuming 1350 litres, and giving 35 carcels. The compression installation for the Champ de Mars was also described. The modifications made to the lamps were mentioned, so as to permit them to have burners of 300 to 1750 litres. To advance still further in this direction, the Company had devised lamps for ten mantles, of 350 litres each, and even more. The gas lighting under pressure was used for the main avenues from the Eiffel Tower to the Château d'Eau. There were 4676 mantles, which gave altogether 90,000 carcels. The duration of those working under pressure was 42 days, and those in the ordinary lamps was about the same. An interesting comparison was made between the lighting of this quarter of the Exhibition by electricity in 1889, and that now carried out; the result being that the illumination was 4·7 times greater in the present Exhibition than in that of eleven years ago.

M. Krafft complimented the author on his interesting paper, especially on account of the great effort put forward by the Paris Gas Company in regard to the lighting of the part of the Exhibition referred to.

There being no remarks on this part of the paper, the second section of it was proceeded with, dealing with heating by gas. It was remarked that in recent years considerable progress had been made in this department; and the Company had conducted careful experiments from the point of view of the hygienic conditions involved in the construction of the heating appliances—the verification of complete combustion, the calorific efficiency, and the general good working of the stoves. Detailed figures and results of the examinations on these points were given.

The third part of the paper—cooking by gas—was next considered. It was observed that the gas-flames for this purpose could be either white or blue; the former being an illuminating flame, without previous mixture of air, while the latter was non-luminous, and had been so mixed. Each had its advantages in certain cases. At Paris, in one of the large restaurants on the Boulevards, it was reckoned that 1300 grammes of coal were consumed per meal, or with gas 200 to 250 litres.

M. Daudy, of Angers, inquired as to the best means of cleaning kitcheners, which were often returned in an exceedingly deplorable state. The author replied that the Paris Gas Company were occupying themselves with this question, and were organizing a special service in connection with it. M. Krafft remarked that it was not every small family that wished for a few thousand cutlets per meal, such as could be cooked by the large stoves described in the paper; and he gave an account of a simple little gas-cooker that he had introduced for the Neapolitans.

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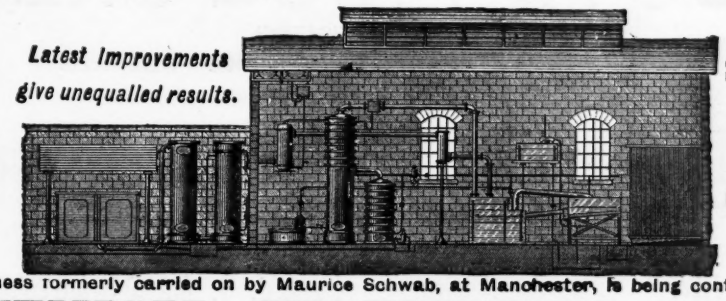

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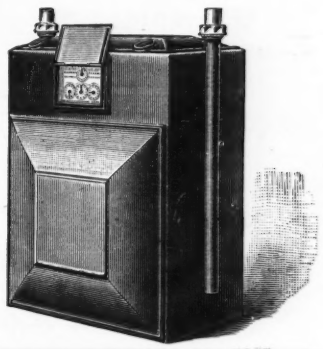

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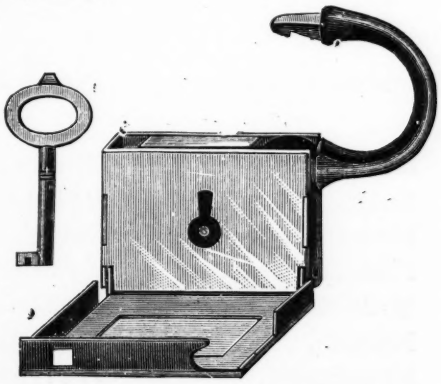

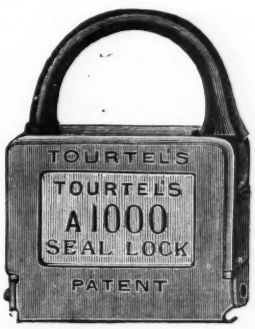

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Consumers' Wet and Dry Meters.

The subject of consumers' meters next came in for treatment; two papers having been prepared by M. Bigeard, of Angers, and M. Asselbergs, of Bergen-op-Zoom. The authors showed unanimity in connection with the respective merits of wet and dry meters, favouring on the whole the latter. Their conclusions were, however, strongly combated by MM. Rouget, Lacaze, and Chamon. The former of the two authors referred to a discussion on the question by the Eastern Counties Association in 1891, and also pointed out some inconveniences of wet meters when placed with new consumers belonging to the working class. Since the introduction of the dry meter, several improvements had been effected in construction; and it seemed to be rapidly growing in favour in certain countries. In order to judge the respective merits of the two systems, the author recently established at his own works a special installation fitted with two meters—one dry and the other wet—registering successively the consumption of gas; and it was interesting to note that the indices were practically identical. Wet meters often gave trouble from frost (and the straining of parts resulting therefrom) and faulty diaphragms; and frequent examination was occasioned. Therefore the author asked whether it would not be useful first to obtain their official stamping, and to establish a laboratory for the testing of meters on the two systems. It was observed that in all European countries, except France, the exact registering of consumers' meters was under the control of the weights and measures regulations.

The second author—M. Asselbergs—in his more detailed examination of the subject, referred to the work done by English gas engineers, mentioning a meeting in London in 1884 at which the opinion was expressed that the dry meter registered too little. In opposition to this, German gas managers had stated that the reverse was the case. Eight reasons were advanced by the author for favouring the adoption of dry meters, and each was treated in turn.

Discussing the papers, M. Rouget defended the use of wet meters, which, by the test of years, had been found more practical. He maintained that the faults noticed by the authors of the papers were easily remedied. The proof of the superiority of the wet meter, he thought, was to be found in the fact that the official verification of them in Switzerland extended to double the time allowed for dry ones. M. Lacaze proceeded to confirm what the previous speaker had said; and M. Chamon followed on the same lines. He considered the superiority of the wet meter was acknowledged by the fact that a greater tolerance was admitted for dry ones. M. Weiss, of Zurich, stated that, according to the new federal regulations, the inspection of dry meters had to be made every ten years; while that of the wet ones was carried out every twenty years. But in Switzerland generally, and in Zurich in particular, they were gradually replacing wet by dry gas-meters, owing largely to climatic conditions. M. Salomons said he thought the discussion undoubtedly showed the wet meter was the more exact of the two, but that the dry had advantages in certain localities, and its mechanism was very simple. When the prepayment system was first introduced into Amsterdam, the form of meter adopted in connection with it was the dry one; and dry ones were demanded by new consumers. M. Rothenbach confirmed what had been stated by M. Weiss, and explained his reasons for preferring dry meters.

Difficulties in the Public Lighting of Guayaquil.

The last paper submitted at the Congress was one by M. Guichard; and it described certain points in the public lighting of Guayaquil—a town in Ecuador. The paper was interesting, inasmuch as it showed the special means to be adopted in special cases. The difficulties in the one described were the result of torrential rains and various insects, which attacked the incandescent mantles employed. On the morning following the placing of 60 of these mantles in the public lamps, 50 were entirely destroyed by these insectile attacks. Protection was given by adding a glass, 7 c.m. diameter and 16 c.m. high; and the lamps were hermetically sealed to ward off the heavy rains. Suitable means were adopted for lighting the burners, and the difficulties encountered were successfully overcome.

Prize for Improvements in the Automatic Lighting of Incandescent Burners.

The end of the technical part of the Congress having been reached, M. Vautier again took the chair. He brought to the notice of the assembly the prize competition of the Société Technique du Gaz (open to inventors of all countries) for improvements in the automatic lighting of incandescent burners. They had, he said, set apart for the purpose 5000 frs., which would be distributed among the successful competitors.

The Closing Scene—"Not Adieu, but Au Revoir."

M. Vautier, again rising, said: Gentlemen, we have now arrived at the end of the technical meetings of the Congress. The Committee, as a whole, thank you for having made their task so easy, and so agreeable. I shall keep, for my own part, in perpetual remembrance the honour I have had in presiding over the first International Congress of our industry. I am glad to say our meetings have been a great success; and I congratulate you on so satisfactory a result. This has been due to the number and importance of the papers read, to the sustained interest in the discussions, to the perfect courtesy that has reigned among us, to the charm of the acquaintanceships that have been made and been renewed, and, finally, to the presence of considerable numbers of members of different countries, among whom we have had the privilege of counting many of the greatest authorities of our industry. It does not devolve upon me to say that this Congress will be followed by others; but I see in this connection a happy augury for the future in the result we have obtained, and in which one of the most satisfactory features is the undoubted manifestations of cordial agreement between the Technical Societies who have come to assist at the Paris Congress. The "International Commission on Incandescent Photometry" which you have formed will leave behind it a practical mark and a moral tie between all. I hope, then, in conclusion, we can say not "*adieu*," but "*au revoir*."

Considerable appreciation of the President's remarks was manifested; and, stepping to the front of the audience (most of whom rose),

Dr. Bunte said: The first International Gas Congress is at length finished; and I am convinced it has faithfully fulfilled the good hopes that we entertained in regard to it. We do not wish to leave without expressing to the Committee of the Congress, and to the members of the Société Technique, our sincerest thanks for the initiative they took in this undertaking, and especially are we obliged to the President, who has had the trouble of directing the meetings. I mention the name of M. Vautier, to whom we offer our warmest thanks for the charming manner in which he has conducted the affairs of the Congress. I ask you to join in an expression of approval, and to show honour to M. Vautier, the President of the first International Gas Congress.

Loud applause followed these remarks; and then the members dispersed. Thus ended the main part of the programme of the conference.

SUPPLEMENTARY MEETINGS IN THE GAS PAVILION.

After the official termination of the technical proceedings of the International Congress, there were held on the three following days—Thursday, Friday, and Saturday—what were called "Conférence-Causeries," or informal meetings on different subjects of interest to the gas industry. The gatherings took place in the saloon of the Gas Pavilion, and were organized by M. Mallet, a Past-President of the Société Technique du Gaz. It may perhaps be doubted, however, whether such additional meetings were altogether well advised, considering the amount of work that had already been crowded into the three days of the official programme. There was an attendance varying from 30 to 50, which, under the circumstances, was as large as could reasonably be expected.

The opening address was by M. Godinet on the subject of the "Utilization of Natural Forces." These he cited as wind, tides, and sea waves, which might be expected to be largely used in the future as sources of energy. How to calculate the horse-power of waterfalls was then shown, and hydraulic mechanisms, wheels, and turbines were described, with the means of driving dynamos therefrom. There followed a survey of the arrangement of hydro-electrical works; and figures were given as to their cost. After considering the financial and technical aspect of high-power electrical stations, and the conveying of current long distances, the speaker concluded by indicating the effect such competitive sources of supply as those mentioned might have on the gas industry.

On Friday morning, M. Euchène, of the Paris Gas Company, lectured on "Thermic Reactions in Gas Furnaces," summarizing again his valuable paper on the subject read before the Congress, as already reported. His remarks were closely followed, and were illustrated by several interesting experiments. Various laboratory appliances, used for the valuation of the heat made and absorbed in gas-furnaces, were employed, and an actual experiment on a sample of coal was successfully carried out. M. Hovine followed on the familiar subject of "Inclined Retorts." He had, however, little of novelty to add to the subject; and his remarks were to some extent a repetition of the Congress paper of Mr. C. E. Brackenbury, to whom he very heartily expressed his acknowledgments. M. Hovine questioned the advisability of adopting retorts 20 feet long, as he thought that the length affected the regularity of the depth of the charge. He also advocated the bygone use of telescopic charging shoots, instead of the now general separate ones. Re-assembling in the afternoon, the Diesel petroleum-engine was described in detail by the aid of diagrams by M. Malle. Either oil or gas could be used as the motive power of the engine; but the former was found the more economical. An exhibition of Holophane globes brought the afternoon to a close.

At a much later hour on Saturday morning than was announced, M. André explained different stoves used for heating and cooking by gas. The latter were put into actual service during the afternoon by a well-known French chef, M. Driessens, who practically exhibited the use of "Gas in Culinary Art." After remarking on the general advantages of gas in the kitchen, being more hygienic, clean, and convenient than coal, he stated

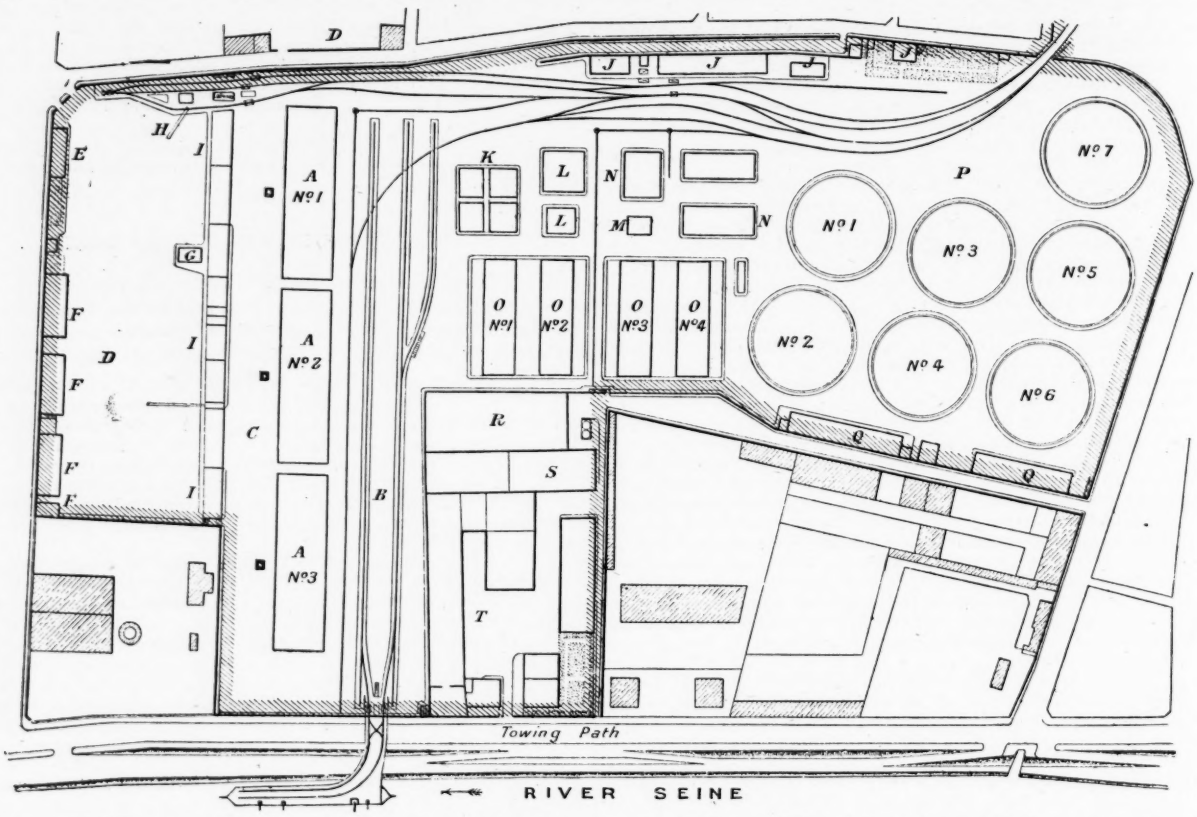
that there were some things that it was absolutely impossible to cook to perfection except by gas. He proceeded, with masterly ability, to give positive proof of the fact; the results being tested by his interested audience.

Thus were terminated, in a practical manner, the informal meetings of the International Gas Congress.

THE VISIT TO THE CLICHY WORKS OF THE PARIS GAS COMPANY.

It was glorious weather on Thursday afternoon when rather more than 200 of the delegates, accompanied by a few ladies, embarked at the Pont de la Concorde on two steamers which had been chartered by the Paris Gas Company for the purpose of enabling the visitors to see the Clichy Gas-Works—the largest of the Company's stations. The Board of Directors (to whom the delegates were much indebted for their exceedingly handsome treat) and the engineering staff were strongly represented, and one and all laid themselves out to interest and please their guests. The trip up the river, through the Exhibition and some of the most beautiful of the environs of Paris, was much enjoyed. Through the unpunctuality of a few of the visitors at the start, time was getting short when the works were reached; and the inspection had to be made rather hurriedly. By the courtesy of the chief officials, we are enabled to give a short description of the works, which will be of interest in connection with the plan which we reproduce, and copies of which were distributed among the party.

The Clichy works, which cover a superficial area of 17 hectares, consist of the gas-works proper; a building for the preparation of the coke, with mechanical appliances for its classification, transport, and stacking, together with a drier (about which some information was given at the time the Gas Institute visited the works in June last); sulphate of ammonia works; and works for the manufacture of carts and waggons required for the transport of material. The works are connected with the Seine by an elevated railway and staging 17 metres high, on which there are three cranes for the raising of coal from barges. Two of these cranes work by steam; and the other is manipulated by a gas-engine of 16-horse power, which allows of 240 tons of coal being raised in ten hours. The works are also connected by a siding with the Western of France Railway. The average annual gas production of these works is 100 million cubic metres—a little more than one-third of the total production of the Company; and the maximum daily production is 400,000 cubic metres. The total quantity of coal carbonized is 320,000 tons. The works are equipped with 1440 retorts in three separate houses, containing in all fifteen benches of twelve settings of eights. The ovens are back to back in pairs; and the retorts are singles. They are 3 metres in length, 65 c.m. wide, and 35 c.m. high. The generators are on the Siemens system, with recuperation by



A. Retort-Houses. B. Coal-Yard. C. Coke-Yard. D. Coke-Stores. E. Coke Sale Office. F. Stables and Farriery. G. Bagged-Coke Drier. H. Coke-Heaping Platform. I. Retort-Stores and Workmen's Lavatories and Dressing-Rooms. J. Offices, Warehouse, &c. K. Pipe Condensers. L. Exhausters. M. Pelouze and Audouin Condensers. N. Pumps and Water-Tank, Smithy, and Store for Purifying Material. O. Purifier-Houses. P. Gasholders. Q. Station Meters and Warehouse. R. Chemical Products Store. S. Sulphate House. T. Wheelwright's Shop and Wood-Stores.

inversion. The coal is carbonized in four-hour charges. Scoop charging is adopted at the rate of two per retort, or 150 kilos. of coal per retort, which gives a total charge of 900 kilos. of coal per retort in 24 hours. The consumption of fuel is 15 kilos. of coke per 100 kilos. of coal carbonized. The stokers are paid by piece, at the rate of 3·30 frs. per 1000 kilos. of coal. For fulfilling certain conditions, they also receive a premium of 50 c. per day, and another of three hectolitres of coke per month, and a gift of about 30 c. per day taken from the profits of the Company. The gas on leaving the retorts passes into sheet-iron hydraulic mains; and thence into long sheet-iron condensers, 1850 square metres in superficial area, in which cooling of the gas commences—an operation which is completed in vertical pipe condensers, of 7225 square metres superficial area, and cooled by water in summer. It then goes into the piston exhausters (six in number), with three horizontal cylinders joined together, each capable of exhausting 84,000 cubic metres of gas per 24 hours. The speed is governed by bell regulators. From the exhausters, the gas flows into Pelouze and Audouin condensers (eight in number), which take out the last trace of tar. It next travels into "Standard" washers—four in number, operated by a gas-engine and Laval steam-turbines—for the absorption of the ammonia. The gas then flows into small purifiers, 124 in number, filled with Laming material—a mixture of oxide of iron, sulphate of lime, and sawdust. This retains the sulphur and the cyanogen in the condition of prussian blue. After purification, the gas passes through ten meters, each of which is capable of measuring 36,000 cubic metres of gas per day, and it then goes into store. There are seven single-lift gasholders, as shown on the plan, having a total capacity of 215,000 cubic metres. The gas leaves the works by three pipes, each 1 metre in diameter. The gas is enriched by cannel coal or benzol. The corrugated retorts on the works are still under trial. Their average thickness is $4\frac{1}{2}$ to 5 c.m. (instead of $6\frac{1}{2}$ to 7 c.m., as in the ordinary retorts). This decrease in thickness enables them to transmit more rapidly the heat to the interior, and to carry a larger charge of coal. The result is a diminution in the consumption of fuel for the carbonization of a given quantity of coal.

On the return journey to Paris, refreshments were liberally provided, and thanks were tendered to the Paris Gas Company for the interesting and enjoyable visit, and for their generosity. M. Gigot, the Chief Engineer of the Company, remarked on the

pleasure it had been to them to receive guests of so many nationalities. The scientific attainments of Germany were well represented; the practical constructional engineers of England were also well to the front; and America, with its perfect mechanical appliances, had its representatives. Other countries were also mentioned. M. Beer, of Berlin, responded on behalf of the German section; M. Godinet expressed the thanks of the members of the Société Technique, who had enjoyed the Company's hospitality; and Mr. C. E. Brackenbury, of London, as Acting-Secretary of the Institution of Gas Engineers, expressed the acknowledgments of the English contingent, as well as a general feeling of thanks for the sustained kindness and habitual courtesy shown by the French. M. Sospizio, of Trieste, spoke of the indebtedness of the Italians. The party reached the landing-stage at about 6.30, having spent a very enjoyable afternoon.

Intensified Gas Lighting.—The Intensified Gas-Light Company, Limited, have recently completed, for the Strand Board of Works, an installation of their high-pressure system of incandescent gas lighting in the large refuge-lamp immediately opposite the Law Courts. The bronze lamp-column is a very handsome one, carrying five large lanterns, hitherto fitted with seventeen flat-flame burners, having a total consumption of 170 cubic feet, and giving the light of (say) 500 candles. The Company have substituted eleven intensified burners, having a consumption of 110 cubic feet of gas per hour, and an illuminating power of 3300 candles. The compressor is fitted up in the lavatory beneath the refuge.

German Acetylene Association.—The second general meeting of this Association will be held at Düsseldorf from the 13th to the 16th inst., under the presidency of Professor O. Dieffenbach, of Darmstadt. The following are the chief technical communications which will be presented at the meeting: "The Utilization of Blast Furnace Gas for Motors in relation to Carbide Manufacture," by Herr Neumann, of Cologne; "The Cost and Prospects of Carbide Manufacture by the Aid of Blast-Furnace Gas," by Herr F. Liebetanz, of Düsseldorf; "The Influence of Temperature on the Yield of Carbide and the Different Types of Furnaces," by Herr E. Grauer, of Lauffen (Würtemberg); "The Market for and Prices of Carbide," by Dr. Münsterberg, of Berlin; "The Methods Adopted by the Association for the Analysis of Commercial Carbide," by Dr. E. Cederkreutz, of Hämekoski (Finland); "The Economical Importance to the People of the Carbide and Acetylene Industries," by Dr. A. Frank, of Charlottenburg; "How have Central Acetylene Supply Works Answered in Practice?" by Professor J. H. Vogel, of Berlin; "Advances in Railway Lighting by Means of Acetylene," by Herr Herzfeld, of Augsburg; "Mains and Services for Acetylene," by Herr D. Bernát, of Vienna; and an Experimental Lecture by Dr. H. Goldschmidt, of Essen, with a practical demonstration of the welding of gas-pipes. An excellent programme of festivities and social functions has been provided.

Interesting Presentations to the Late Gas Engineer at Derby.—Mr. Charles Taylor, Assoc.M.Inst.C.E., who recently retired from the position of Engineer and Manager to the Derby Gas Company, was made the recipient of two beautiful presents from the employees on the 31st ult. The gifts consisted of a silver salver, which had been subscribed for by the staff and the men at the Cavendish Street works, and a very fine carriage clock from those at the Litchurch works. Both bore suitable inscriptions. The presentations were made in the Board-room of the Company—Mr. H. Swingler, the Chairman, presiding—by Mr. W. Edge and Mr. T. Mason, the foremen at the two works, who referred to their long association with Mr. Taylor, and expressed the regret of all that the time had come for the severance of their connection with one who had always shown himself to be an upright, honourable, and straightforward gentleman. Mr. Taylor, on rising to acknowledge the gifts, was very heartily received. He said he should treasure them not only on account of their value, but more especially because of the good feeling which prompted the givers. Such gifts, such kindnesses, and such feelings were almost beyond the power of thanks; but he could assure those from whom they had emanated that they would remain with him and in his memory as long as he lived. The occasion was an opportune one to name another pleasing incident, and it was that the Chairman had sent him from London a silver inkstand, with the following words attached: "With kind regards as an expression of good feeling to Mr. Taylor on his retirement, H. Swingler, July 3rd." He could assure the Chairman that this kind act would long be remembered, and that his pleasing gift was very highly valued. Referring to his successor, Mr. J. Ferguson Bell, he expressed the hope that the men would work pleasantly under him; and he wished Mr. Bell success, prosperity, and happiness in the work which he had undertaken. Mr. Bell, moving a vote of thanks to Mr. Swingler for presiding, congratulated Mr. Taylor upon the pleasant feeling that existed between him and the workmen, and said he hoped that, as time went on, this feeling would continue. That trust and confidence should exist between the Manager and the men was of the highest importance; and it was his earnest wish that the employees of the Derby Gas Company would long remain a happy, united, and contented body of workmen. Mr. H. Bullivant (the Secretary) briefly seconded the motion, which was unanimously carried, and acknowledged by Mr. Swingler.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 654.)

THE week just closed on the Stock Exchange was quite the counterpart or continuation of the preceding week, so entirely did the characteristics of the one resemble those of the other. Business was, of course, on the most moderate scale—quite at holiday low pressure—and that was the only unfavourable feature about it. Business hours, too, were curtailed by the closing of the Exchange on Saturday. But in spite of this, the cheerful feeling which had brightened the previous week was undiminished; all the influencing factors being propitious. So prices all round looked up; Consols and the gilt-edged division leading the advance. The Money Market was easier, though there was a slight disposition to fluctuate. In the Gas Market, there was some show of a disposition to renewed activity, though naturally, at this time of year, there could be no expectation of a marked tendency. But, better than that, was the evidence of recovery from the low figures to which some issues had recently been put down, and the precise reason for which has never been quite clear. Thus changes in quotation, though not numerous, are in the upward direction without exception. In Gaslight issues, very fair business was done in the ordinary almost daily at steady prices within the quotations; and the secured issues were fairly brisk at the old figures. But neither showed any tendency to push higher. South Metropolitan was little dealt in; and the prices at which it changed hands gave no particular indication of any tendency. A little was done in Commercial at middle prices. The transactions in the Suburban and Provincial group were extremely scanty; but some nice advances in value were made—Tottenham and Edmonton and Crystal Palace having a good rise. The Continental Companies were extremely quiet, but strong; Union and Imperial advancing. Nothing observable occurred among the remoter undertakings, beyond a slight advance in River Plate. Business in Water was much the same as usual; and the favourable tendency continued, Chelsea and East London advancing.

The daily operations were: Monday opened with moderate business in Gas issues—chiefly Gaslight and Tottenham. Prices were good; and Tottenham "A" rose 3. Transactions were more limited on Tuesday; but prices were on the rise. Imperial and Tottenham rose 2 each, Crystal Palace 1, and River Plate ¼. Wednesday produced no greater activity; but prices were firmer, and Union rose 2. In Water, Chelsea advanced 2. Thursday's operations were on a par with the previous day's, and nothing moved. A quiet day on Friday closed a quiet week. Tottenham "A" advanced 3, and Crystal Palace 2. In Water, East London rose 2, and Chelsea 1.

MR. A. D. PROVAND, M.P., ON THE COAL PROBLEM.

LIKE the oysters in the pathetic story of "The Walrus and the Carpenter," articles on the coal problem "follow thick and fast." Last week we dealt with Mr. Benjamin Taylor's paper in the "Nineteenth Century;" to-day we have to notice a contribution on the subject to the "National Review," by Mr. A. D. Provand, M.P., who took a leading part in bringing the question before the House of Commons during the past session. The letters in which he urged upon the Government the need for a new Royal Commission to inquire into the many aspects of our coal resources and consumption, were dealt with in the "JOURNAL" at the time of their publication. As our readers know, Mr. Provand was not successful in his efforts to obtain the appointment of a Commission. He now renews his plea and repeats his arguments, dealing, moreover, with the question more fully than he could do in the course of his correspondence with Mr. Balfour, though, as he remarks, his present article "is necessarily incomplete—a volume would be required to treat the question with adequate fulness."

Mr. Provand naturally begins with an account of the causes which, in his opinion, have led up to the state of affairs that has prevailed during the greater part of the past year. Over most of that ground we need not now travel; but we may recall a point made more than once in these columns, and noted by Mr. Provand—namely, that the effect of a small excess of demand over supply is, in the case of an article of prime necessity to the whole community, altogether disproportionate to that excess. "When, of any necessary article, such as food or firing, there is only enough to supply twenty, and there are twenty-one who desire to be supplied. . . . the advance will not be merely 5 per cent., but several times as much." The excess of requirements over output in the case of coal has certainly not been more than 5 per cent.—equal to 11 million tons—but the price has gone up anything between 50 and 100 per cent. The moral, of course, is (and it is worth emphasizing, for the encouragement of the pessimistic) that a 5 per cent. increase in the output, or a similar shrinkage in demand, would have a correspondingly disproportionate effect on the market in the opposite direction.

Mr. Provand seeks to minimize the amount of importance to be attached to the influence of the increase in the exports of coal in helping to bring about the present high prices; but we cannot say he is successful in the attempt. In fact, we entirely fail to

see the point—we were almost going to say the sense—of his argument. He says: "The exports and the coal shipped for the use of steamers taken together (making all that went abroad) were, for the first seven months of last year, 31,973,484 tons, and for the same period this year, say, to 1st July (*sic*), 32,805,809 tons, making an increase of only about 2½ per cent., or, actually, 832,325 tons. There was nothing in this extra export which would have affected the price." Here we may remark that Mr. Provand appears to have forgotten his previous statement, that a small difference between demand and supply may have a large effect on the price of coal; and it will be seen that the increased demand in question is equal to about ¾ per cent. on the total output for the period. He proceeds: "Indeed, if the export by itself had been likely to affect prices, these would have advanced *in* 1898, *instead of last year;* for while the increase of shipments for the first seven months of this year is very small, the increase of 1899 over 1898 was about 17 per cent.—say, 6 million tons. Moreover, the whole of this increase was between January and August last year; but there was no general movement in prices until September."

We have italicized words in these sentences, because they appear to us nothing less than absurd. How in the world could an increase of exports in 1899 of 6 million tons compared with those in 1898 affect prices in 1898? As to the argument that the sending of an additional 6½ million tons of coal out of the country in the early part of last year cannot be said to have been in any way responsible for the advance in the price, because that advance did not become fully developed until later in the year, we need only ask whether it is seriously suggested that the fact that, on the approach of last autumn, stocks of coal throughout the country were at a minimum and, but for the aforesaid increase in exports, would have been several million tons heavier, had no share in bringing about the scarcity and dearness of coal during the ensuing winter. No one has argued that the increase of coal shipments has been the sole cause of the high price; but the suggestion that the reduction of the quantity available for home consumption by 6½ million tons did not play an important part in the enhancement of market rates, is made for the first time by Mr. Provand, and is hardly worthy of one who comes forward as an expert in the coal question.

There are one or two other blemishes in an otherwise valuable article. Mr. Provand says that the principal cause of the higher price, "is undoubtedly the largely increased consumption of coal in our manufacturing and metal industries, which altogether consume 60 per cent. of our production." His own figures show that the percentage does not exceed 50—a difference of over 20 million tons. Again, Mr. Provand says that the Royal Commission of 1871 estimated that our consumption of coal in 1901 would be 162,400,000 tons. He omits to say that the Commissioners gave more than one estimate, and that the one to which they appeared to attach most importance put the production in 1901 at 203 million tons. The quantity of coal available was reported by the Commission as 146,480 million tons; Mr. Provand speaks of 146,680 millions. The last is a small mistake; but the others should not have been made in an article which is intended to provide the public with accurate information.

Mr. Provand estimates the increase in the average price of coal over that for the first nine months of last year at the moderate figure of 6s. a ton, which, on an output of 220 millions, amounts to an increase in cost to consumers at home and abroad of £66,000,000 per annum. Of this sum, he assigns 11⅓ millions to the miners, or 6s. 3d. per week per man; the balance he assumes to go, in indeterminate proportions, to the mineowners and the middlemen or coalfactors. It is only fair to these two last named to say that some portion of the 54⅔ millions has gone in extra cost of materials and higher freights—perhaps the odd 4⅔ millions. A round £50,000,000 is, however, a goodly sum whereout to lay by for a rainy day.

Emphasis is strongly laid on the great extent to which the trade of this country and the maintenance of her population depend upon coal. This dependance has increased with great rapidity; the coal raised per head of the population having risen from 52 cwt. in 1858, to 108 cwt. in 1899. Mr. Provand points out that we import nearly four-fifths of the wheat and rather more than two-fifths of the meat we consume, besides very large quantities of other kinds of provisions. To pay for this, we have to export manufactured goods (which are dependent upon coal for their production) and coal itself. "All the money in the country would not pay for six months' supply." It is, therefore, essential to our existence as a nation that we should have coal available at a price which will enable our exported goods to hold against all comers the foreign markets from which we obtain our supplies of food and raw materials. The two comers chiefly to be feared are, of course, Germany and the United States.

The competition of the former is not likely to be so formidable as that of the latter. Like our own country, Germany "has had many industries largely stimulated by the expenditure of taxes. She has problems to face in regard to labour, which will come in demands for higher wages, shorter hours, and in other ways; and the perennial conflict between the agrarian and commercial interests will always create serious difficulties. Her coal output is less than half as much as ours, the quality inferior, and the price higher. . . . There is nothing to fear from her competition which we may not overcome by education and industry." It is from across the Atlantic that the most severe competition will come, and will be widely felt. "The basis of American success will be that, excepting tea, coffee, sugar, and a few minor articles, they produce all, and in some articles more than, they can consume, and have, therefore, large quantities of food, cotton, and other products to sell to the world. Their resources of cheap coal and iron-ore are almost without limit." Whereas the average value of coal at the pit in England has ranged from 8s. 3d. in 1890 to 7s. 6d. in 1899, and the yearly average never fell in that decade below 5s. 10½d., the price at the pit-head in America has fallen from 5s. 2¾d. in 1890 to 4s. 8½d. last year, and never exceeded 5s. 4¾d. in the interim. Yet up to 1889 the cost of coal in the States was always appreciably higher than in this country. These are facts pregnant with future influence on British trade, and not creditable to British enterprise.

In this connection, we may quote Mr. Provand's remarks as to the cost of railway transit of coal in this country, made in reference to the suggestion of the railway companies that they should raise their coal-carrying rates in view of the increased cost to them of coal. In Mr. Provand's opinion, these rates ought rather to be lowered, and could be if only the companies would provide improved rolling-stock for goods traffic, such as that used in America, where carriage is only a fraction of what it is here. "The difference between the American rates and and ours are (*sic*) better understood when we say that a 150-mile haul with us would add fully 7*s.* per ton to the cost of the coal, whereas in the United States it would only add about 2s." There is no room for doubt that John Bull has got to bestir himself, if he does not want Cousin Jonathan altogether to "wipe his eye" in commerce. "Mr. Punch's" cartoon last week was decidedly *à propos*. Mr. Provand has no good word to say for the proposal to clap a 5*s.* duty on coal exports. "The expediency of such an import will not, I believe, bear examination, and the general public have probably little knowledge of the results which it would produce. . . We should. . . add to the cost of that which is indispensable to the maintenance of our commercial position—namely, food and raw materials."

Finally, the case for a Royal Commission, with widely-drawn terms of reference, is put before the public; the need for careful consideration of all possible means for economizing the consumption of coal being especially and wisely urged. "I am confident," says the writer, "that in many cases those who use coal for steam raising are unaware of existing inventions and methods which would enable them to work with increased economy." As to the general questions involved—"A large mass of accurate information is now in possession of the Geological Survey, of mining engineers, of merchants, and of others, which would be available for a Royal Commission. Whether the conclusions of a Commission would be favourable or otherwise to our commercial prospects, measured by our coal power, is quite beside the point. What is required is a knowledge of the facts so far as it is possible to procure them, in order that we may prepare for the future and avoid being taken by surprise." We hope that after the General Election such a Commission as that for which Mr. Provand pleads will be appointed. Meantime, Mr. Provand has done much to inform the public, and to stimulate their interest in a question of tremendous national importance.

THE CONSTRUCTION AND CARE OF GAS-ENGINES.

THE increasing popularity of the gas-engine as a convenient supplier of motive power, claims for any additions to the literature connected with it some notice at the hands of those whose duty it is to record the progress of the industry which is so intimately bound up with the success of this engine. We therefore direct attention to two books which have lately reached us dealing with the subjects referred to in the head-line.

The larger work is a joint production, which, although professedly a practical treatise on gas-engine construction, is concerned mainly with the design and building of one of half-horse power.* The authors acknowledge that there are in existence many good books on the theory, design, and form of the gas-engine, but none furnishing instruction as to how to make one, and moreover to make it well. It is to the task of supplying this want that they have applied themselves, and they have produced a book of 282 pages of text, with a very large number of illustrations. The scheme of the work, as explained in the preface, is to give an amateur a broad and thorough knowledge of the principles of various forms of gas-engines, to show him how to make one by practical shop methods, and furnish him with a set of modified rules for designing similar engines. In the elaboration of this scheme the authors spent an entire year; and they confess that they will be well rewarded if their labour has the effect of advancing the standard of amateur workmanship, and aids the student to find in the construction of the model gas-engine "a useful, practical, and pleasant mechanical exercise." In their opening chapter, they explain clearly how a gas-engine works, and go on to describe the four classes of explosion engines. Then they enter upon the real subject-matter of their book—the design of a gas-engine to meet the requirements of the amateur who needs small power, and who wishes to build his

* "Gas-Engine Construction, for the Student, the Scientific Investigator, and the Amateur Mechanic." By Henry V. A. Parsell, jun., and Arthur J. Weed. London: Sampson Low, Marston, and Co.; 1900.

own engine. The next four chapters deal with patterns and tools; and then the constituent parts of the engine are fully described. The "amateur" will not be justified in complaining that the subject has been superficially treated, for it is not until the twenty-first chapter that he is shown how to put his engine together. In the concluding chapters, hints are given on regulating and starting, on the construction of a gasoline carburetter for use where coal or natural gas is not obtainable, and on the design of engine details. At the end of the text is an annotated bibliography of gas-engine books and periodicals published in the English language; and there is an index. We do not wish to depreciate in the least degree the authors' work, or to deter any intelligent amateur who may have the time and patience, from trying to make a gas-engine. But we cannot help thinking that he would acquire the necessary skill far more quickly, and produce a better result, by taking a turn in "the shops." However, Messrs. Parsell and Weed have endeavoured to give him the benefit of their assistance in the form of a book of which the general get-up leaves nothing to be desired. The question is whether it will be bought by a sufficient number of amateurs desirous of constructing their own gas-engines to bring an adequate return for the outlay attending its production.

The other work which has lately come to hand must not be dignified to the extent of being called a book, inasmuch as it is simply a trade pamphlet of 40 pages stitched in a wrapper; but it offers some excellent advice on the care and management of gas-engines.* As the author was for some fifteen years with a firm of gas-engine makers whose name is known the world over for the excellence of their productions, he may claim to know a little about this class of motor; and in the pamphlet he has issued he has endeavoured to give, briefly and clearly, such general directions for their management as are likely to be of service to users. He has been careful to avoid all technicalities, in the hope that the directions given will be sufficiently explicit to enable the engine attendant to undertake small adjustments and repairs when they are required. The general arrangement of the engine-house is appropriately dealt with in the first chapter; then comes some good advice as to keeping the engine clean. It has been too frequently stated as a recommendation of a gas-engine that it requires "no attention." This statement, as the author points out, is unfortunately interpreted too literally by many users. He insists that it does need attention; and if it does not get it, trouble and extensive renewals are sure to be necessitated. Having properly cleaned the engine, the next thing is to start it; and some useful hints are given on this matter. But the best-conducted engine will occasionally go wrong, through leaky valves, missing fire, insufficient or improper charge, or some other cause. Useful remarks are offered on these various matters, and the author then takes up the subject of renewals and repairs. He next deals with the recent improvements which have been made in gas-engines, and shows how increased power may be obtained. The pamphlet contains information which an engine-minder might find useful to have close at hand. Everybody who has had to depend upon power for keeping his works going knows how inconvenient it is to have to stop for hours while outside "expert" help is obtained to repair what is really only slight damage. The presence on the premises of an intelligent man capable of carrying out the directions given by the author, would in all probability allow of such help—which is in too many cases a hindrance—being dispensed with.

Edison's Latest Wonder.—According to a "Daily Express" telegram from New York a few days ago, Mr. Edison has perfected apparatus for "producing electricity in quantities of commercial utility by a device much like the familiar thermopile." He is said to apply heat to the junction of two pieces of metal, the composition of which is a secret, and thus set up a flow of electric current.

Waverley Association of Gas Managers.—The 79th half-yearly meeting of this Association will be held in the Cross Keys Hotel, Dalkeith, on Thursday. There will, as usual, be a short address by the President of the Association—Mr. William M'Giffen—and an informal discussion; the places for next year's meetings will be fixed; and there will be a midday dinner. In the afternoon, the members will drive to the Newbattle Collieries, and examine the electrical and coal-cleaning plant on the surface. Opportunity will be afforded for descending to the workings, and inspecting them under the guidance of the colliery officials.

Eastern Counties Gas Managers' Association.—The 24th general meeting of this Association will be held on the 19th inst., in the Council Chamber, Spalding (by permission of the Council), under the presidency of Mr. J. G. Hawkins, the Gas Engineer. According to the programme issued by the Hon. Secretary and Treasurer (Mr. J. H. Troughton, of Newmarket), the members will assemble at the gas-works, where the President will invite them to partake of luncheon; and the business will be subsequently transacted. In addition to the Inaugural Address, there will be a paper on "The Working of Inclined Retorts at Cambridge," by Mr. R. Brown. At the close of the proceedings, there will be a visit to Ayscoughfee Hall and Gardens. Early in the evening, the company will dine together at the White Hart Hotel.

* "The Care and Management of Gas-Engines." By Henry Booth. Hull: James Plaxton and Co.; 1900.

OBITUARY.

The death is announced of Mr. J. N. FORSTER, Engineer and Manager of the Skegness Gas-Works. Deceased had held this position for about twenty years.

The death is announced of Mr. JAMES WATSON, who for about a quarter of a century was Manager of the Rye Gas Company—a position which he relinquished three years ago on account of ill-health. Deceased was in his 79th year.

As will be seen by an intimation which appears elsewhere, the Sheffield Gas Company are requiring a Superintendent of Mains. This position has become vacant by the death, from an attack of typhoid fever, of Mr. S. H. BRADSHAW, who had been with the Company eight years; having gone to them from Salford. His loss is much felt by the Company; and unfortunately he leaves a widow and two children.

Mr. RICHARD CLARKSON SMITH, who in July retired from the directorate of the Devonport Gas Company, on which he had served for more than half-a-century, died on Tuesday last, at the age of 89. Deceased, who was a native of Devonport, spent a life of much usefulness and activity in the town. He formerly carried on business as a stationer and dealer in fancy goods, and at one time edited and published a weekly newspaper. For many years he occupied a seat in the Town Council; and for two years, 1865-6, he was Mayor. He also had a seat on the Magisterial Bench, and attended with much regularity; while his interest in some of the educational and philanthropic institutions of the town was marked and continuous. As Chairman of the Gas Company for more than forty years, he had a thorough knowledge of the working of the undertaking, and was constant in his attendance at the works until failing health confined him to the house. Out of respect to his memory, the municipal flag was hoisted at half mast; and at the Police Court the Mayor spoke in sympathetic terms of his public work.

PERSONAL.

Mr. W. M'AULIFFE, of Port Chalmers (N.Z.), has been appointed Manager and Secretary of the Lyttelton (N.Z.) Gas Company, Limited.

Alderman HIGGINBOTTOM, the Chairman of the Electricity Committee of the Manchester Corporation, has accepted the office of Lord Mayor of the city for the coming municipal year.

Mr. JOSEPH HAWKSLEY has been appointed Manager to the Great Yarmouth Water-Works Company, in succession to Mr. John Ayris, M.Inst.C.E., whose resignation of the position has been mentioned in the "JOURNAL."

The marriage is announced of Mr. ARTHUR VALON, eldest son of Mr. W. A. M'Intosh Valon, of Ramsgate, to MARY GERALDINE, youngest daughter of the late Mr. J. Ashcroft Noble and Mrs. Noble, of Clapham Common. The happy event took place on the 5th inst., at St. Luke's, Battersea. With his large circle of friends in the gas profession, we congratulate Mr. Arthur Valon, and wish him all happiness and prosperity.

At the recent half-yearly meeting of the Sutton (Surrey) Gas Company, it was decided, on the suggestion of the Directors, to recognize the completion by Mr. STEPHEN CARPENTER of 25 years' service as Manager of the works, by presenting him with a gold watch and chain suitably inscribed. The appreciation by the shareholders of the value of Mr. Carpenter's work was evidenced by the cordiality with which the suggestion was adopted.

Mr. C. JEFFERY, Manager of the Portland Gas Company, whose undertaking is about to pass into the hands of the District Council, has been appointed, out of 79 applicants, Manager and Collector to the Ware Gas Company. Mr. Jeffery had practical training at the Cowes Gas-Works for about six years, and from there went to New Westminster (British Columbia), as Manager of the gas-works—a position he held for about four years. He has been Manager at Portland for seven years, for the last three of which he has had the collecting under his control. During his management the consumption of gas has nearly doubled.

Among the prizes proposed by the French Société d'Encouragement pour l'Industrie Nationale, is one of 2000 frs. for a motor weighing less than 50 kilos. per horse power developed, another of 1000 frs. for the utilization of any waste product, and a third for a method of purifying water for domestic use. All papers are to be in French, and sent in before Dec. 31.

An automatic check-valve used in the Geneva Water-Works is described in the "Génie Civil." The essential feature is a concave valve balanced to keep it lifted as long as water is on both sides of it. The surplus weight is proportioned to the maximum speed at which the water is to be taken off at the lower end of the pipes. If a pipe should burst, the pressure on the valve overcomes the balance-weight, and the valve closes. When once closed, it cannot again be opened until the pipes are full of water, for which purpose a bye-pass is provided. A hydraulic brake on the dash-pot system prevents the valve from closing too rapidly.

TECHNICAL RECORD.

INCANDESCENT GAS LIGHTING.

By Dr. H. BUNTE, of Carlsruhe.

[A Paper read before the International Gas Congress in Paris.]

Incandescent gas lighting, as opposed to the older lighting by means of flat-flame and argand burners, during the past decade has assumed the predominant position in Germany. The Welsbach light is now the recognized form for both public and private use; and the older types of flame lighting are continually losing ground. It has thus effected a complete revolution, not merely in regard to the illuminating effect and the economy of gas lighting, but even the fundamental factors by which gas is valued, and the properties and methods of manufacture of gas, have been entirely altered.

Formerly "illuminating power" was regarded as the principal criterion of the value of gas. Now by far the greater part of the gas, whether it is used for lighting or for heating, is first of all mixed with air in the bunsen burner. By this means the illuminating constituents of flames are completely destroyed, and the heating effect of the blue bunsen flame alone comes into play. The quantity of light yielded is, in incandescent lighting, no longer directly dependent on the quality of the gas as made on the works and distributed to the consumer. It is primarily dependent on the nature of the mantle which is brought to the luminous state in the bunsen flame. It is, therefore, a matter of prime interest to the gas industry to follow the improvements in the manufacture of Welsbach burners, and constantly to obtain a true conception of the efficiency of the mantles which are on the market.

Notwithstanding that numerous photometric trials have been reported in periodicals and circulars during the last ten years, it seemed very desirable—in view of the extraordinary development of the Welsbach light in Germany—to make exhaustive and systematic researches on the efficiency of the different mantles at present on sale. At the suggestion of the author, the German Association of Gas and Water Engineers put itself in communication with the Imperial Physical-Technical Institute at Charlottenburg, in order to secure from the outset the highest attainable degree of precision and reliability in these researches. With the co-operation of Herr Drehschmidt, of Berlin, Dr. Krüss and Dr. Leybold, of Hamburg, and Herr Schæfer, of Dessau, a scheme of work was arranged with the Imperial Institute. By this scheme, the mantles most generally used in Germany were first to be examined at Berlin, Charlottenburg, Dessau, and Carlsruhe according to uniform methods. This work was carried out or commenced last winter.

Dr. Liebenthal, on behalf of the Imperial Physical-Technical Institute, reported on this first series of researches at this year's meeting of the German Association of Gas and Water Engineers at Mayence.* The researches dealt with five descriptions of mantles from the most renowned factories, by which about three-fourths of the mantles used in Germany are produced. The results of these researches, which are being continued, can only be regarded as provisional; but they offer a valuable comment on the question as to, "What is the duty afforded at the present time by a mantle of average composition under normal conditions of use?" The researches referred to would suggest the following as an answer to this question: A carefully incinerated incandescent gas-mantle affords, on the average, an illuminating power of 70 Hefner units (61 English candles) for 300 hours, at a consumption of 4·24 cubic feet of gas per hour under a pressure of about 12-10ths. This is equivalent to a consumption of 0·07 cubic foot of gas per candle-hour. At first the illuminating power generally exceeds 80 Hefner units (70 candles), and after 300 hours' use falls to not less than 60 Hefner units (52½ candles); but after still longer use, it does not recede appreciably further.

On comparing this conclusion with the result of a photometric investigation of 14 descriptions of mantles carried out in the winter of 1895, and published by the author in the "Journal für Gasbeleuchtung" (see "JOURNAL," Vol. LXVI., p. 180), considerable improvement is noticeable both in regard to economy, and even more in regard to the constancy of the illuminating power, or the uniformity of the light emitted on protracted use. At that time, after 300 hours' use, the greater number of the mantles had dropped to less than 40 Hefner units (35 candles); and even the best showed a diminution of 45 per cent. in illuminating power after that period of use. The best of the recent descriptions of mantles show only an average falling off of about 12 to 20 per cent. in illuminating power; and this falling off is not considerably increased on yet longer use.

Incandescent gas lighting has thus fully substantiated the claim that it affords the brightest and cheapest light; and it has again considerably improved its advantage over other competitive methods of illumination both in economical and hygienic aspects. With gas at a price of 4s. 6d. per 1000 cubic feet, the cost of a light of 100 Hefner units (87·7 candle power) value amounts, on the average, to only ¼d. per hour, compared with about 1·6d. for the old flat-flame and argand burners. In like ratio at least have the hygienic conditions improved; as for the same illuminating value, only about one-fifth part as much heat and products of combustion are emitted into the room which is lighted by the gas.

The efficiency here given of the incandescent gas-burner, in reality, indicates merely the lower limit which is attainable by a proper choice of burners and mantles without more ado, wherever ordinary coal gas is available under the customary pressure.

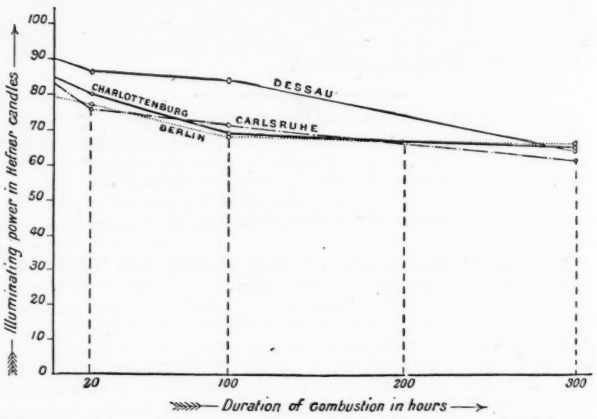
Far greater illuminating effects can be secured if gas is consumed under enhanced pressure in special burners (Bunte and Eitner, "On the Illuminating Power and Colour of the Kügel Light," see "JOURNAL," Vol. LXXV., p. 265). The duty then becomes increased to about 25 candles per cubic foot of gas consumed per hour; and powerful sources of light of several hundreds or even thousands of candles in value can be produced. These rival in brilliancy and economy the electric arc light. What brilliant illuminating effects are obtainable by means of high pressure gas is shown by the successful lighting of the Champ-de-Mars at the Paris Exhibition by the Paris Gas Company, which has thereby done a great service by introducing to the general public the high-pressure incandescent gas light for public lighting.

The illuminating effect obtained by the use of the incandescent light is independent (within a wide range) of the quality of the gas; and is dependent more especially on the method of combustion and the composition of the mantle used. These important facts, which have been pointed out previously (by Herr von Oechelhaeuser, see "JOURNAL," Vol. LXXIV., p. 764, and by the author in a paper only recently published), were demonstrated likewise in the above-mentioned systematic researches carried out in collaboration with the Imperial Physical-Technical Institute.

Photometric measurements made at various places in Berlin, Charlottenburg, Dessau, and Carlsruhe served to determine whether the quality of the gas used at each place of observation had any effect on the duty afforded by the mantle, and the magnitude of the effect if any. For this purpose, simultaneously with the photometric tests of the mantles, there were made determinations of the illuminating power of the gas in similar specially selected flat-flame burners, and of the calorific power of the gas by means of Junkers' calorimeter. The illuminating power in a 5 cubic feet batswing burner, at a rate of consumption of 5·3 cubic feet per hour, and the calorific value of the gas used in the different places where the observations were made, were found to be as follows:—

Illuminating Power—Hefner Units.	.	9·4	..	8·8	..	11·6	..	12·4
[English Candles	.	8·2	..	7·7	..	10·2	..	10·9]
Calorific Value. Calories per cubic foot		146	..	142	..	148	..	141·5

Notwithstanding this relatively great divergence in the illuminating power of the gas in a flat-flame burner, no difference is to be detected in the duty obtained from the mantles. The results obtained at the different places were instead closely concordant, as is indicated by the annexed diagram, which shows the average duty of the mantles at the several places of observation:—



AVERAGE ILLUMINATING POWER OF INCANDESCENT MANTLES DURING 300 HOURS.

In order to pursue further the study of this highly important technical question, and to determine what influence greater changes in the chemical composition of the illuminating gas have on the development of light by the Welsbach burner, artificial mixtures of coal gas with hydrogen, carbonic oxide, water gas, marsh gas, ethylene, and benzene, were made in the author's Institute; and the illuminating power afforded by these mixtures was observed and compared with that of unmixed coal gas in the Welsbach burner. The results of these researches with mixtures of gases are given in the table on p. 643.

It should be observed, with reference to this table, that the values given can indicate only the probable proportionate effect of the several admixtures on the development of light in the Welsbach burner. Every change in the composition of the gas, strictly speaking, demands an altered method of combustion,

* An abstract of Dr. Liebenthal's report will be given in the "JOURNAL" shortly.—ED. J. G. L.

	Illuminating Power.			
	In a Flat Flame Burner at a Consumption of 5'3 Cubic Feet per Hour.		In the Welsbach Burner.	
	Hefner Units.	English Candles.	Hefner Units.	English Candles.
Coal gas	15	13'2	70	61
			Illuminating Power of the Unmixed Coal Gas in the Welsbach Burner taken as 100.	
Coal gas mixed with :—				
20 per cent. of hydrogen	7'3	6'4	100	
20 ,, ,, carbonic oxide	3'0	2'6	85	
20 ,, ,, marsh gas	12'5	11'0	88	
20 ,, ,, water gas	3'1	2'7	105	
25 ,, ,, ethylene	40'3	35'3	136	
Coal gas carburetted with benzene	25'0	21'9	108	
,, decarburetted by paraffin oil	6'2	5'4	93	

especially in respect of the quantity of air admitted to the bunsen burner. In these researches, however, this circumstance has been in the first place ignored, and attention has been given rather to the immediate practical object of ascertaining how the same Welsbach burner utilizes unmixed coal gas and mixtures of gases showing considerable differences in composition. It will be seen constantly, that great changes in the composition of the gas, which reduce the illuminating power in flat-flame and argand burners by more than one-half, or considerably increase it, and likewise greatly alter the calorific value of the gas—such changes as the admixture of hydrogen, marsh gas, and ethylene effect—produce only relatively small differences in the illuminating duty with the Welsbach burner.

The explanation of such a remarkable fact is to be found in the peculiar conditions of combustion in the bunsen burner. The gas, as is well known, prior to its combustion has added to it in the mixing-tube of the bunsen burner a quantity of air insufficient to effect its complete combustion. But, on the other hand, there is sufficient to bring about complete disillumination of the flame. As soon as this mixture of gas and air, issuing from the tube of the burner, is brought to the temperature of ignition by the hot flame which encompasses it, incomplete combustion ensues, and, in a measure, combustion of air in an excess of gas. This is what happens in the inner green cone of the flame. By this means, almost all the so-called heavy hydrocarbons are decomposed and partially burnt; and the products of the incomplete combustion, in addition to carbonic acid and steam, are carbonic oxide and hydrogen, with residual portions of marsh gas (which is only decomposed and burnt with difficulty), and a little acetylene. The hot gases which issue from the green core of the flame of the bunsen burner on to the interior of the mantle consist in all cases essentially of carbonic oxide and hydrogen, whether either rich or poor illuminating gas is used. These gases are burnt in the outer zone of flame which is delimited by the meshes of the mantle, by means of air which enters from outside it. They thus yield carbonic acid and water vapour; and the combustion raises the meshes of the mantle to an intense white incandescence. The combustion around the mantle thus is with all gases—even of very diverse composition—essentially combustion of carbonic oxide and hydrogen. Thus it is evident that the duty afforded by the mantles is affected only to a comparatively small degree by changes in the composition of the gas used.

Observations and experiences up to the present do not furnish sufficient information for a more exhaustive analysis of the phenomena of combustion around the mantles, or for the solution of many other important questions of modern gas lighting, though recent years have witnessed the presentation of highly important communications on the cause of the light emission from the Welsbach burner. Among researches in this direction may be mentioned recent ones by Le Chatelier and Boudouard, and by Nernst and Bose, by which it was shown that the Welsbach light acquires its brilliancy from the high temperature of the skeleton, consisting of rare earths. The feeble thermic radiation of the skeleton permits the mantle to acquire rapidly and completely the high temperature of the flame gases, and the relatively great capacity of the mantle for radiation within the limits of the visible portion of the spectrum constitutes the great economy of the burner.

Whether the bunsen flame straightway has the high temperature required, in all parts of the mantle, in order to heat the ashy skeleton uniformly to the most intense white incandescence, or whether the process of combustion is stimulated by catalytic action of the material of the mantle and the uniformly intense incandescence of the mantle thus brought about, has not yet been decided. In any case, experiments made some time since at the author's instigation in his Institute by Herr Luggin have proved that the Welsbach material can be brought by catalytic action on a cold mixture of gas and air, as it issues from the bunsen burner even without flame, to a state of full luminescence.

Bearing in mind that the incandescent gas-light owes its illuminating power and brilliancy entirely to the high temperature of the flame, the grounds on which the properties of illuminating gas are estimated, and the methods used in its manufacture, must be modified, because since the introduction of the Welsbach light the production of light has resolved itself simply into a question of heating.

Under the former *régime* of flat-flame and argand burners, the greatest value attached to the production of a gas rich in the so-called heavy hydrocarbons, ethylene and benzene; as the lighting effect of the flame depended entirely on the presence of these constituents. Regard for securing and preserving these illuminants determined both the selection of the raw material and the choice of the method of gasification. For coal gas, a particular and uncommon gas coal is needed; and this coal consequently is costly. The distillation of the coal, in gas-works of all sizes, can be conducted only in comparatively small retorts, which must be drawn and re-charged about every four or six hours. Thus a great expenditure of labour and wages is required. When larger distillation chambers, and longer periods of working off the charges, are adopted, the heavy hydrocarbons are to a great extent destroyed; and the illuminating power of the gas is thereby considerably depreciated.

But as incandescent lighting and the use of non-illuminating gas for heating and lighting continue to spread, these illuminants, which were formerly so essential and were obtained at such cost, become less and less valuable. For the determination of the quality of gas a photometric test of the illuminating power with a batswing or argand burner can no longer form a proper criterion. It is the calorific value of the gas which now plays the most important part.

But when the gas industry is freed from the antiquated control of tests of lighting value in flat-flame and argand burners, it at once acquires a freedom in the selection, both of raw material and of methods of manufacture, which is of supreme significance in respect not only of its whole future development but also of the supply of towns with light, power, and heat by means of gaseous fuel.

Under such circumstances, gas manufacture is no longer restricted to the use of a special gas coal which is scarcely obtainable in sufficient quantities even at a very high price; but selection may be made from an enormously wider range of raw materials, and their employment is considerably facilitated. In the manufacture of gas, there is no longer the restriction to a tedious and costly distillation in small retorts, with a short time for carbonization. Instead, large chambers, like coke-ovens, may be used according to the extent of manufacture; and these can be attended to, by mechanical means, considerably more easily and cheaply. Other methods of gas manufacture also acquire greater importance, as well as the distillation process. The water-gas process, either with or without oil-gas production or carburetting with benzene vapour, by means of which the calorific value as well as the illuminating power is controllable, could serve as an auxiliary to the coal-gas process, especially in times of scarcity of coal. It would render great service to the industry by facilitating the production of such a mixed gas.

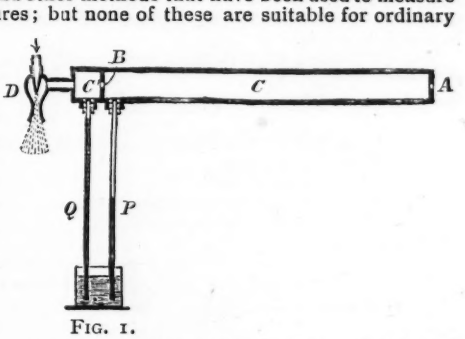
Under the domination of the incandescent gas-light, there is thus opened out wide scope for activity and advance both in the processes of gas manufacture and the descriptions of apparatus used; and scientific investigation, as well as practical inventive genius, has in this direction a subject which will well repay attention devoted to it.

THE MEASUREMENT OF HIGH TEMPERATURES.

By Alten S. Miller, of New York.

[A Paper read before the International Gas Congress in Paris.]

Up to a comparatively recent date, no instrument had been invented that would enable one to easily and continually measure temperatures of 1000° Fahr. or over. You are all familiar with the air thermometer, thermo-couple, platinum resistance coil, fusible alloys, and other methods that have been used to measure high temperatures; but none of these are suitable for ordinary continuous working. They lack the element of continuity, are too delicate for ordinary work, are inaccurate, or lack in some other way the qualities necessary for accuracy and ease of manipulation. It is my intention to describe an instrument which I have been testing for some months past, and which seems



A and B are orifices in platinum diaphragms at each end of a chamber C. D is an aspirator which keeps a uniform suction on the far side of B in the chamber C'.

Fig. 1.

to be eminently suited to the measuring and recording of temperatures below that at which platinum begins to soften. The principle of its operation is illustrated by fig. 1.

Air will be drawn through B by the suction in C′, and a partial vacuum will be created in C, which will cause air to flow through A. In a few seconds equilibrium will be established, and the amount of vacuum in C and C′ will be measured by the water-gauges P and Q respectively. If the air entering at A is heated, the temperature at B and the vacuum in C′ being kept constant, the vacuum in C will increase. The height of the water in P therefore indicates the temperature of the air entering at A.

Fig. 2 shows how the foregoing principles are applied in practice. To maintain a uniform vacuum, C′ is a vessel partly filled with water into which runs the tube *n n′*. If the vacuum is greater than the depth of the lower end of the tube below the surface of the water, air will come down through *n n′* and reduce the vacuum. In practice, a small amount of air flows through *n n′* when the apparatus is in use, and the suction is kept

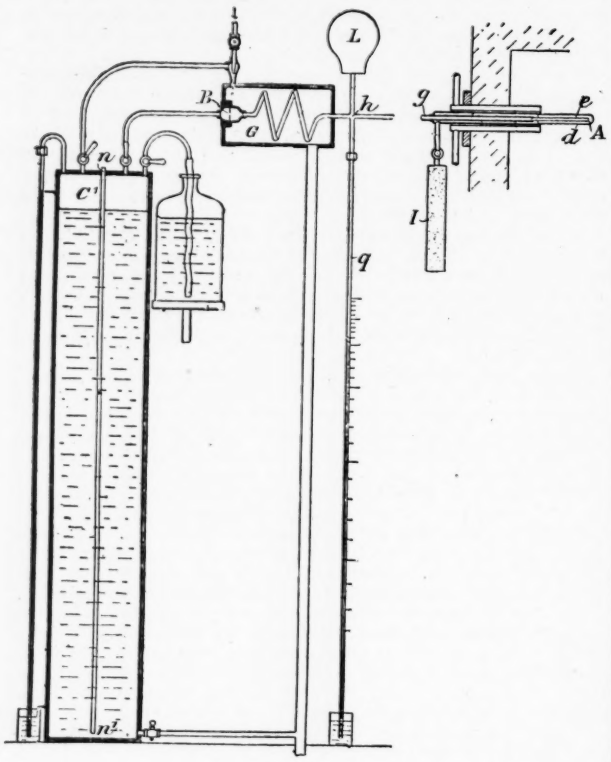


FIG. 2.

constant. In order to keep the temperature at B constant, the latter and a portion of pipe through which the approaching air reaches the aperture are enclosed in a vessel through which the steam exhausted from the aspirator is passed. The air flows slowly enough to take the temperature of the steam before reaching the aperture B. The vacuum is measured by the water gauge Q (fig. 2), and by a recording gauge L.

The entering air first goes through a filter of raw cotton I, and thence to a platinum tube *d*, where it reaches the temperature of the surrounding medium. The aperture A is in a second platinum tube *e*, which is inside *d*. Where the tube *e* is outside the influence of the greatest heat, it is attached to a copper tube *g*, which is surrounded by a water-jacket. The tubes *g* and *h* may be connected by a tube of any length; but it is preferable to keep the diameter small, as the lag of the pyrometer is in a measure proportional to the volume of air contained in the pipe between A and B.

The calibration of this apparatus would seem to be a very simple matter.

$$C = \frac{\text{area A}}{\text{area B}}$$

b = barometric pressure in inches of mercury.
b' = pressure in C.
b'' = pressure in C′.
t' = absolute temperature at A.
t'' = absolute temperature at B.

Theoretically—

$$b' = \frac{b'' - C^2\frac{t''}{t'}b}{2} \pm \sqrt{\frac{C^2 t''}{t'}b^2 + \frac{\left(b'' - C^2\frac{t''}{t'}b\right)^2}{4}}$$

Experimentally, it has been determined that b is much lower for any given temperature than the above formula would indicate; so, instead of being able to calculate the scale of each instrument, it is necessary to graduate each one separately, using a standard pyrometer for this purpose. The standard is checked from time to time with a platinum ball calorimeter, to ensure its accuracy. On this subject, I quote from a letter of Mr. Alfred Steinbart, a member of the firm who make the pneumatic pyrometer:

The theoretical curve is considerably lower than the practical. For instance, for a temperature of 1000° C. the instrument would show for b' only 758° C.; in other words, the theoretical curve reads, at 1000° C., 242° lower. This, in my opinion, is due to the contraction of the jet of air flowing through the apertures. This contraction depends upon the shape of the hole, so that we can easily make an instrument read 200° Fahr. high or low at will, by changing the shape of one aperture without changing its area. It is also possible to make an instrument read right with the scale at 212° Fahr., but high or low 200° at 2000°. I have used two apertures of as near the same dimensions as I could get them, and heated both one time to 212° Fahr., and the other time both to 100° Fahr. The water column in the instrument showed the second time 0·28 inch higher than the first time. This was several times repeated with the same result. In the formula—

$$b' = \pm \sqrt{\frac{C^2 t''}{t'}b^2 + \frac{\left(b'' - C^2\frac{t''}{t'}b\right)^2}{4}} + \frac{b'' - C^2\frac{t''}{t'}b}{2}$$

if we insert for the temperatures t' and t'' the same value, C cannot change, as the openings are of the same size and material, $\frac{t''}{t'}$ will be equal to 1. So the formula gives the same value for b' each time; while in practice there is a considerable difference for as small a change as 112° Fahr. This, to my belief, is due to the change of contraction through the temperature.

As the tension of the air in C is not what it is calculated to be by assuming the form of *vena contracta* to be the same at all temperatures, tests were made with a platinum ball to see whether the instruments as sent out were properly graduated, and whether they varied after being exposed to heat. These tests, extending through a series of months, indicated the graduations to be commercially accurate. They showed further that the instruments did not change, but that the pressure in the intermediate tube C always indicated correctly the temperature at A.

A fall in the barometer would tend to decrease the value of $b - b'$ which is measured on the gauge P. On the other hand, the lowering of the boiling-point of water due to the fall in the barometer would tend to increase $b - b'$. Both of these influences are very small, and in practice they so nearly neutralize each other that the instruments are not appreciably affected by a change in the barometer.

The advantage of an instrument that will record high temperatures is evident. At present, it is necessary to depend in a large degree on the eye and memory. After experimenting for a period, we decide that certain heats are about right in the various parts of a bench or water-gas apparatus, and instruct those in charge of the gas making not to let them vary from the determined point. It is almost impossible to keep a constant heat when dependence is placed upon the unaided eye and upon memory; so it is important to eliminate these two sources of error, and to get absolute records. It will also be very interesting to note the temperatures in the retort during the carbonization of coal. With one pyrometer in the centre of the charge of coal and the other above it, records could be made that would be very valuable.

I will not take up more of your time in suggesting uses for a pyrometer. As our business is chiefly with heat and high temperatures, the importance of being able to measure these temperatures is too obvious to need further comment.

PACIFIC COAST GAS ASSOCIATION.

Annual Meeting at San Francisco.

(*Continued from p.* 527.)

A lecture on "Some Chemical and Physical Characteristics of California Petroleum," prepared by Mr. A. S. Cooper, State Mineralogist of California, was read by his Assistant, Mr. C. G. Yale. These characteristics varied greatly, not only in different oil fields in the State, but even in the same strata. At a short distance apart, there may be considerable differences; and the first yields of a well were often lighter than those obtained after pumping for some time. The Californian petroleums contained unknown combinations of carbon and hydrogen, together with minute quantities of sulphur, oxygen, and nitrogen. The presence of these three elements, if only in traces, had a marked effect on the boiling point, melting point, and the character of the distillates. They were mixtures of a large number of hydrocarbons, with sulphur, oxygen, and nitrogen compounds, of which the sulphur compounds usually predominated. When exposed to the air, the petroleums absorbed oxygen, and would also do so when heated with peroxides. A similar action took place when they were exposed to vapours of sulphur or heated with persulphides. Fractional distillation did not give a true index, and ultimate analysis was worthless as a test of the character or composition. Like coal, the petroleums were constantly giving off carburetted hydrogen; and this was probably due to acids, alkalies, and other oxidizing agents which formed oxygen compounds with the bitumens. Decomposition might also be caused

by sulphurizing agents forming sulphur compounds with the bitumens; and both these reactions took place within the earth, leading to the production of natural gas. One of the reasons that California petroleums had such a high specific gravity was the fact that the formation in which they occurred was tilted and broken, which permitted the escape of the gases; and if the process of evaporation continued long enough, solid asphaltum was formed. The evaporation from an underground oil-tank was much less than that from a tank above ground and exposed to the sun; and, therefore, if the store-tank could not be below ground, it should be shaded from the sun and whitewashed, to decrease the absorption of heat. If petroleum of 40° B. specific gravity was exposed to the sun for a short time in a shallow pan, it would decrease 20 per cent. or so in volume; and the portion so lost was more valuable for gas manufacture than the remainder. Fresh supplies should be admitted to the bottom of the store-tank and not at the top. Attention to this point would secure a considerable saving as regards loss by evaporation. The asphaltum remaining after distillation contained 5 to 9 per cent. of sulphur; and it could be adopted for any purpose where a plastic and unalterable cement was required. Some wells in California yielded oils containing paraffin; and these were so valuable as a source of illuminating oil, that their use for gas making had been prohibited. At Baku, in Russia, a tract of less than 20 acres of land produced in twelve years 35 million barrels of oil, and was still producing 12,000 barrels per day. In Santa Barbara County (Cal.), there were large tracts of bitumenized sand; and in any one of several 20-acre lots at this place, the area of sand exposed would show that it contained 8 million barrels of heavy petroleum of the consistency of molasses, representing before evaporation eight times that quantity of ordinary petroleum. So that, on each 20-acre tract, there were the remains of 64 million barrels of oil; showing that in California, as in Russia, very small areas might yield immense quantities of petroleum. Bitumens occurred in all the geological formations of rock, and were found saturating layers or seams of sand or shale; as many as ten of these seams being discernible on the eroded sides of some of the anticlinal ridges of the coast range. The sand beds were very irregular as regarded thickness—ranging from a few feet up to over 500 feet—and when several seams were to be seen on the side of a mountain, or traced by their outcrop on the surface, the bitumen, if present at all, would generally favour the geologically lower beds; and when a sand contained bitumen, the underlying sand beds were also liable to contain it. At present, nearly all the wells that were being bored were in the vicinity of surface indications—such as gas blows, oil seepages, or outcrops of bituminous rock; but the day was not far distant when oil territory would be selected by geologists irrespective of surface indications. At present, the wells are shallow; but they would then be much deeper, and would yield lighter oils. Owing to the large area (about 40,000 square miles) and thickness of the unaltered rocks, and the great number and thickness of oil-bearing strata, the yield of oil in future would be enormous. But so long as coal maintained its present value, it could not be expected that the oil would fall in price. In several ways it was a most desirable substitute for coal. In 1899, the import of coal into the state was about 1¾ million tons; and to replace this, nearly 7 million barrels of oil would be required. As the supply became more permanent, there would be a large and increasing demand for fuel oil. The removal of the gasoline and illuminating oil left a residue having a high flash-point and free from water, and therefore more suitable for use as fuel than the crude oil. The asphalts in the crude oil were objectionable to the gas maker; partly because they evolved large volumes of sulphuretted hydrogen at gas-making temperatures, and also because they led to the formation of carbon and heavy pitch. The large percentage of sulphur was also an objection to the use of asphaltum as a fuel. But apart from this, the market value of the asphaltum was too high to admit of its being used with economy either for gas making or fuel. So it was evident that crude oil should not be used for either of these purposes, but that it should be separated by distillation into various qualities. In treating of the distillation of the crude oil, it was remarked that in Pennsylvania the upper half of the still was left exposed to facilitate decomposition; but there must be a great loss of heat. During the first distillation of crude California oil, decomposition should be avoided; and therefore the stills should be completely bricked in, and generally the whole process of treatment should be different from that practised either in the States or in Canada. Most of the crude Californian oils should be distilled twice to reduce the proportion of sulphur compounds, which could be eliminated to a great extent by repeated distillations. A distillate of a certain density, distilled under ordinary atmospheric pressure, may contain large quantities of sulphur. But a similar distillate, obtained *in vacuo*, may be comparatively free from sulphur. Probably in the first case a higher temperature was required, and the additional heat decomposed the sulphur compounds. And if a current of hydrogen at a high temperature was introduced into the vapours of the light hydrocarbons during distillation, the sulphur compounds would be taken up by it and carried away from the still. At ordinary temperatures petroleum would not absorb sulphuretted hydrogen; and it was supposed that in the crude state, the lower hydrocarbons in the California petroleum did not contain sulphur compounds, but were sulphurized during distillation, by such compounds evolved from the higher hydrocarbons. At 60° Fahr., the action of hydrogen on the sulphur compounds was slight; at 200° Fahr. it was rapid; and at higher temperatures still more so. A fair average result from the distillation of a crude oil would be 3 per cent. of gasoline, at 75° Beaume; 4 per cent. benzene, 63°; 13 per cent. illuminating oil, 45°; 8 per cent. mineral sperm, 38°; 21 per cent. gas distillate, 28°; 27 per cent. lubricating oils, 26° to 15°; 11 per cent. asphalt; and 13 per cent. loss. Over a number of first distillations, the products ranged from traces up to 15 per cent. of naphtha at 150° C., from 6 to 27 per cent. illuminating oils at 300° C., 16 to 30 per cent. gas distillate at 350°, 20 to 52 per cent. lubricating oils, and asphalt and loss 7 to 25 per cent. Distillation by means of a current of steam injected into the liquid itself would probably give better results than dry distillation; and certain gases that were not condensable and not likely to react chemically (such as hydrogen or carbonic acid) might probably be as effective as steam. The production of petroleum in the States was steadily advancing.

Replying to questions, Mr. Yale said that the present production of petroleum was only about one-third of the quantity required to supplant coal. There were only two wells in the State yielding petroleum having a paraffin base; and their production was small. But the quality was excellent—being almost a pure lubricating oil, which was worth 16s. 8d. per barrel, or four times as much as the asphalt-base oils. By the expression "base," he referred to the residue after distilling off the lighter constituents. There was a large demand for asphalt—the local prices being about £5 5s. per ton, and in New York as much as £7 10s.; and this of itself rendered the fractional distillation desirable and profitable.

Mr. John A. Britton, of Oakland (Cal.), read a paper on "The Best Methods of Introducing Gas-Stoves." He advocated selling gas-stoves at cost, or even less, and said that the maintenance of a high price for gas was the cause of failures to establish profitable sales of gas for fuel. They were also provocative of dissatisfaction and competition. Larger sales would reduce the expenses of maintenance and general charges on the plant; and increased consumption invariably followed a decrease in price. Fuel gas should in any case be supplied through a separate meter, so that the consumer could tell how much was used by the stove, and how much for light. If the gas-bill was high, the stove got the blame, and was frequently dispensed with. It was also very desirable for the manager to know how much gas was used for lighting and how much for fuel. Where the price of gas exceeded 4s. 2d. per 1000 cubic feet, he advocated special rates for the stoves. The manager should not lose sight of a stove directly it was sold, but care for it just as he did for his mains and services, and inspect and repair it, if necessary, every six months. Some time ago, he observed that out of 2200 stoves, some 400 showed no consumption. He employed a competent person to canvass these 400 delinquents. The defect was discovered in each case, and remedied by the Gas Company. Within 18 months they had only 15 stoves showing no consumption; and the 400 averaged nearly 2000 cubic feet of gas per stove per month. Then there must be continual advertisements, not circulars and pamphlets only, but constant newspaper advertisements. In his experience, selling the stoves for cash was preferable to renting or hire-purchase. Demonstrations given in the household by a competent person were worth a thousand fancy demonstration lectures on dishes rarely used in ordinary life. The best consumers were the middle classes, who readily recognized the speed, reliability, cleanness, and cheapness thus secured. Hot plates stopped the sale of many a cooker, and he fervently wished there were none in existence.

Discussion being invited, Mr. Jones described the demonstration cooking lessons as conducted at San Francisco. The whole town was covered, by female canvassers, who took a district each week; and the lectures were carefully adapted to ordinary every-day requirements. Neatly printed invitations with a good gas-stove advertisement were issued, also printed recipes, &c.; and every care was taken in making these announcements really attractive. There were nearly 14,000 gas-stoves in use in San Francisco. Mr. M'Neil favoured selling the stove right out at cost. When a customer bought an article, he took care of it; but if provided free, it was not valued. At one time he gave away £200 worth of gas-stoves, and found absolutely no benefit. Dr. Powers said one thought occurred to him on hearing the paper. The author advocated going to a great expense, and all to get a sale at a cheaper rate. Might not the reduced price and the special expenses swallow up all the profit? If the same energy was applied to extending the sales of illuminating gas, might not the result be more profitable. Before going to large expenses in pushing gas-stoves, he would like to know something about the actual profit on them, as distinct from the lighting. He could quite see that the consumption would be largely increased; but after paying all the extra expenses, there might be no increase in profits. He hoped some enterprising gentleman would determine what the actual profit on the gas-stove business was. Mr. Aldrich did not believe in going to the expense of advertising a thing, and then selling it at less than cost, but in selling at a fair profit. Nor did he believe in separate meters. He wanted to sell gas, no matter what it was used for, and therefore preferred a scale of discounts according to the quantity used, and a further discount for the use of gas-stoves, all subject to prompt cash payments. Many would not be in sympathy with him; but he would add that he paid 6 per cent. on his preference and 5 per cent. on his ordinary stock, in face of the cheapest electric light and power in the United States. With regard to dirty gas

stoves, he did not propose to start a mission in favour of ordinary cleanliness; but he took good care that the stoves on show at his office were as neat and clean as possible. Hot plates were no use as regarded increasing the sales of gas; and he agreed with the author that they would be better without them. He believed in a good show-room, and had one 100 ft. long by 25 ft. wide filled with the best collection of stoves he could get together; and in that room cookery lessons were given from time to time. This was the best means of advertising. Newspaper advertisements were no use. He paid £250 per annum or so for a 6-inch space, and could not trace any benefit from it. If it was desired to attract ladies of the middle classes, there was nothing like advertising cooking lessons. With regard to getting out stoves, he ventured to assert that the only way of placing any quantity was to let them on hire at moderate rents—say 2s. 1d. per month. He was open to sell on immediate or deferred payments; but, where he sold one stove, he rented 20. The sum received for rents in 1899 was nearly £500. Mr. Valentine remarked that he had done fairly well in placing stoves, with a uniform rate of 7s. 3d. per 1000 cubic feet for gas, and selling at a trade profit. Mr. Keyes spoke in favour of a minimum charge—say not under 4s. 2d. per month—to each consumer. If companies would try it, they would be surprised to find how little objection was made. Out of all his customers, there had not been one who complained. All paid freely, even if they had only used 200 or 300 cubic feet of gas. In special cases, he would waive the minimum charge by arrangement. In reference to Dr. Powers' remarks, Mr. St. Clair cited the case of Bakersfield, where they had lost nearly all the illuminating business owing to cheap electricity. It would have been utterly useless to try to push gas for lighting; but they had established an excellent and a profitable stove business.

Mr. Britton, in replying, said that Mr. Aldrich's experiences differed from his own, which showed that the question was to a great extent a local one, and that it was not safe to tell a gasman what he ought to do in his owndistrict. In reply to Dr. Powers, he might say that up to two years ago he had very little success in the stove business. He had only placed about 1500 in 15 years; and the gas consumed by them was about 24 million cubic feet per annum. Now he had nearly 4000 stoves out, using 75 million cubic feet per annum; and this had been achieved by the means indicated. The total cost of advertising, canvassing, expenses of show-room connections, new services, and everything incidental to the stove business was about £2000 per annum; and for that he sold 50 million cubic feet of gas. No one would make a mistake in reducing the gas to the lowest possible point and in selling stoves for cash. After trying rental for many years, he found it a dead loss and no help to consumption. To put the thing another way, the average total outlay per stove was about £3 6s. 8d., and the sales averaged 14,500 cubic feet per stove per annum. So the cost of introduction was recovered in two years. He was strongly in favour of water-back stoves in preference to separate heaters, and put in two water-back stoves to one without a water back.

Mr. L. P. Lowe, of Passadena (Cal.), read a paper entitled "The Synthesis of Commercial Gas," which was really a kind of popular lecture on the chemistry of coal gas and the properties of the principal constituents. He illustrated his remarks by several experiments, using samples of hydrogen, methane, ethylene, and carbonic oxide.

The Editor of the "Wrinkle" Department, Mr. G. H. Hollidge, of Mered (Cal.), submitted a report including illustrated descriptions of twelve different subjects. In one of these it was stated that after long experience with oil pipes it was found that heated oil rapidly corroded brass stopcocks, and iron ones were therefore used in preference. Another subject was "An Air Trap to Assist the Correct Registration of Oil-Meters." The author remarked that when once bubbles of gas or air found their way into the cylinders of the oil-meter, they could not escape, and they lessened the capacity of the cylinder and caused incorrect registration. As close as possible to the inlet of the meter he placed a small tank or cylinder, 6 in. diameter and 36 in. deep, into which the oil was admitted from the top, and drawn off from the bottom. Any gas or air present in the oil accumulated at the top; and a gauge glass was provided to show when this had occurred to any extent. The air or gas was blown off once or twice a day, as was found to be necessary, by opening a valve provided on the top for the purpose.

(To be concluded.)

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Allowance to be Made for Fast and Slow Meters.

SIR,—I understand it is the custom, when testing a gas-meter, to pass (say) 100 cubic feet through the test meter, and if the other meter registers 112 cubic feet, it would be called 12 per cent. fast. Then, for example, if the quarter's or half year's consumption was (say) 126,500 cubic feet, 12 per cent. thereon is 15,180 cubic feet—say, 15,200 feet—which would be credited; leaving 111,300 cubic feet to charge.

Now, the proper way to make the calculation is by the rule of three thus: Taking the above figures for example, if 112 = 126,500, what does 100 equal? This will give what the consumption would have been had the meter been correct. Thus:

As 112 : 100 : : 126,500 (*i.e.*, 126,500 × 100 ÷ 112) : 112,900

which the consumption should have been. Now deducting 112,900 from 126,500 leaves 13,600 cubic feet to credit, and not 15,200 cubic feet as arrived at by the customary method.

On the other hand, if the test meter registers 100 and the other meter only 88, this meter would be 12 per cent. slow; and if the consumption for the quarter or half year were 126,500 cubic feet, then by the usual method 12 per cent., or 15,200 cubic feet, would be added—making the total to charge 141,700 cubic feet, whereas it should be calculated as follows:—

As 88 : 100 : : 126,500 (*i.e.*, 126,500 × 100 ÷ 88) : 143,700

which the meter would have registered had it been correct, and consequently is the quantity to charge.

In the case of the meter 12 per cent. fast, it is 12 *in every* 112 *incorrectly registered;* and in the case of the meter 12 per cent. slow, it is 12 *in every* 88 *incorrectly registered.* Herein lies the error in the customary method of calculation, as in each case it is taken as 12 in every 100. A little reflection over the following figures will easily explain the matter: The test meter registers 100, while the incorrect meter registers 112, which is 12 per cent. fast. Now, 12 per cent. on 112 is 13·44, which would be taken off according to the customary way of calculation; whereas it can be seen at a glance that only 12 should be deducted.

Sept. 6, 1900. GAS-METER.

Slot Consumption where Meters and Fittings, Etc., are Supplied.

SIR,—I have read with very great interest the communication from Mr. George Helps, of Nuneaton, in your issue of the 28th ult., on the above subject. The whole article bears the imprint of practical experience and careful consideration. It certainly serves to emphasize the fact that the consumption of automatic installations where cookers are *not* supplied is scarcely worth having, and should result in those gas companies who have not yet adopted the supply of a gas cooking-stove as an integral part of the installation, reconsidering their position.

The average consumption of a gas cooker with a 12-inch oven and two burners on the top may be safely taken to average 8000 cubic feet per annum. A 14-inch by 12-inch oven, with three burners on the top, will consume, on an average, from 10,000 to 12,000 cubic feet per annum.

Taking the cost of the smaller cooker, with 12 inch oven, at an average (say) of 30s., the profit Mr. Helps estimates as between the cost price of 2s. 6d. per 1000 and the automatic meter price of 4s. 2d. per 1000 will realize a gross profit per annum of	12s.	0d.
And accepting his estimate of the amount required for depreciation at 10 per cent., this stove will cost per annum 3s., add (say) 5 per cent. per annum for interest on capital (1s. 6d.)	4	6
Leaving on the small cooker a net annual profit of . .	7s.	6d.
Taking the cost of the larger cooker, with 14-inch by 12-inch oven, at (say) 40s., and reckoning the estimated increased consumption at (say) 11,000 cubic feet, the profit on the same basis—viz., 1s. 8d. per 1000—would be a gross profit per annum of	18s.	4d.
With depreciation on the same basis (10 per cent.), the stove will cost per annum 4s. Adding (say) 5 per cent. per annum for interest on capital, or 2s, we get . . .	6	0
Or on the larger cooker a net annual profit of . . .	12s.	4d.

These profits may be taken to be well within the mark, as they do not provide for any extra profit which might be fairly attributed to the use of the cooker in the daytime, and they are arrived at after allowing 5 per cent. interest on the full cost of the stove, which with the 10 per cent. depreciation would become, after ten years, additional profit.

That the sum of 7s. 6d. and 12s. 4d. per annum profit should remain after deducting 10 per cent. for depreciation and 5 per cent. for interest on the full cost, disregarding the effect of the 10 per cent. depreciation, is, I think, sufficient justification for abolishing all stove-rentals.

No better proof that the estimates of these consumptions are reasonable can be found than the figures which Mr. J. Ferguson Bell, of Derby, gave in his Presidential Address to the Midland Association of Gas Managers last March, and which I referred to in your issue for the 20th of that month. Mr. Bell showed that he got at Stafford an average consumption from automatic meters without a cooker of 6366 cubic feet, and from automatic meters with a cooker of 18,783 cubic feet, or a difference of 12,447 cubic feet through the addition of the cooker.

If further proof is needed, the following extract from Mr. W. B. M'Lusky's (of Perth) Presidential Address to the Waverley Association of Gas Managers last April (see "JOURNAL," Vol. LXXV., p. 999) will supply it: "Coming now to coin meters, I find that our second year will account for a consumption of 676,000 cubic feet, against 508,000 cubic feet for the first complete year, being 168,000 cubic feet more—an increase equal to 33 per cent. Of 80 coin meters fixed, 20 (or exactly 25 per cent. of the total) have cookers attached; the balance have boiling-rings. An analysis of the accounts shows that the 20 cooker installations consume, on an average, 18,900 cubic feet per annum; whereas those without cookers consume an average of 4966 cubic feet each. Coin meters with cookers attached are, therefore, worth practically 14,000 cubic feet per annum more than ordinary coin meter installations. In other words, the 20 cooker installations give a return for the year of 378,000 cubic feet, and the 60 ordinary installations a return of 298,000 cubic feet." The advisability of supplying best-grade stoves to better class automatic consumers will, I believe, in time engage the attention of gas engineers. It has met with conspicuous success where adopted—such concessions made on a commercial basis are certain to benefit both gas companies and consumers.

I can only hope that the result of Mr. Helps's valuable contribution to your pages may be to convert those gas companies who have not yet adopted cookers with automatic installations, and to induce those who now charge a rental for cookers to abolish it.

Sept. 6, 1900. E. W. T. RICHMOND.

MISCELLANEOUS NEWS.

COALOWNERS, GAS COMPANIES, AND THE COAL QUESTION.

After the excitement caused by the arrival in the Thames of a cargo of American coal for the South Metropolitan Gas Company had subsided, there was a slackening of interest in the coal question. It has, however, revived again, owing to the publication of the accounts of "interviews" with Mr. Livesey and Mr. Rylatt, of New York—the former as the cause of the importation of the coal, and the latter as possible medium by which further supplies may reach us from across the Atlantic. The coal bought by the South Metropolitan Company has been under trial; and as soon as definite results have been arrived at, Mr. Livesey has promised to forward them to us for publication. In the meantime, the Company's Engineer (Mr. C. C. Carpenter) states, in the course of a letter addressed by Mr. Livesey's instructions to the Editor of "Sell's Commercial Intelligence," that the coal is "very decidedly superior" to that which the Company are in the habit of using, "notably in regard to the yield of gas per ton, the illuminating power, and the remarkably low quantity of sulphur." He adds that "the coke also is of very good quality." Should further trial verify the claim made for the coal, that it will yield 15,000 cubic feet of gas per ton, it will, Mr. Livesey says, be the cheapest for the Company at the present high price of English coal; and they will continue to use it if successful. The coal was put on board at less than the English figure; but the cost here is greater. It is, however, a question of quality rather than one of price. Freightage is at present the impediment to the free importation of American coal; and this is the difficulty which Mr. Rylatt and those with whom he is associated propose to surmount. According to the "Daily Chronicle," these gentlemen have gone carefully into the matter, and when once they have brought the cost of freight down to 10s. a ton, they believe they will be able to cut into the London prices, and offer coal at a much cheaper rate than the consumer is now paying—in fact, at less than 25s. a ton. If shippers decline to offer them the above-mentioned terms, they will procure transports of their own. Asked whether the result would not be that the British coalowners would reduce their prices to a point below that at which he could trade with a profit, Mr. Rylatt replied: "Whatever happens, the British consumer will get his coal cheaper. But I do not fear any action which the colliery owners here may take when once we get our freightage rates down to 10s. British coal is dear, not because the supply is short, but because the demand is heavy. The official returns show a very peculiar state of things. While in one sense coal is scarcer than it has ever been before, the past year's output is the largest on record. This simply means that the consumption of coal all the world over is going up by leaps and bounds. England has proved that, in spite of her unprecedented output, she cannot meet the growing demand without resorting to extortionate prices. Now America is coming forward as a great coal trading country; and the competition will keep British prices steady. For many years England was the largest coal-producing country in the world; but America has at last got ahead of her in total output, and our increase in proportion is at a higher rate than England's." On the subject of quality, Mr. Rylatt remarked as follows: "In the three chief kinds of coal—steam, house, and gas—we can hold our own with English supplies of the best. The very reason that prompted the South Metropolitan Gas Company to order their recent shipment from America was because of the superior gas-producing properties of American coal. As for steam coal, your own Admiralty is looking out for a supply from us; while only recently a contract was concluded for supplying a million tons for the French Navy. Russia is also taking large supplies from us for her Navy. In fact, it is said that the coal from the well-known Pittsburg seam, which is used in the United States Navy, is the best steam coal in use." Mr. Rylatt added that his chief orders at present are from Continental ports; but negotiations are pending with regard to supplies for London and Liverpool. Nothing, however, can be done until the freightage rates are reduced; and he is confident this will be done shortly.

A rumour having become current that the trial by the South Metropolitan Gas Company of the consignment of American coal recently received by them had not produced good results, and that the Company would be forced to buy 500,000 tons of coal in the home market, a representative of the "Daily Express" called at the offices to make inquiries on the subject. Mr. Livesey was away, but certain information was furnished, which we give below under reserve, in view of the promise made by Mr. Livesey, already referred to, to publish the results in our columns: "The details volunteered may be briefly summarized as follows: 'American coal for gas making is a failure. Its yielding powers are a long way behind Newcastle coal; and the experiments made by the Company bear this out. This is a fair statement; and Mr. Livesey is not afraid of the result of his trial being made known to the members of the coal ring. Nor does the question of the supply of coal cause Mr. Livesey any anxiety. Offers are constantly coming in from friendly firms and large contractors; and while such a supply is available, there is no possible chance of the coal ring forcing Mr. Livesey's hand to a contract for a six months' supply. It is true that between now and next March 500,000 tons will be required by the South Metropolitan Gas Company; but nothing in the way of famine has threatened the Directors.'"

Two of the Directors of Messrs. W. Cory and Sons, who have been interviewed by a "Daily Express" representative on this subject of American competition, declare the stories about coal being put on the London market at 25s. a ton to be without foundation. One of them went on to say: "The real *crux* of the question as to whether America will ever be able to compete is quite another matter. At present she has no ships, for she is not an importing country; and when an American merchant charters a vessel he has to pay a freight both ways instead of one. Boats have to go out there in ballast. To put it broadly, nine-tenths of the boats chartered do go out in ballast. The best steam coal costs 13s. a ton on board, and the American merchants want to put prices up. Add to this cost the freight charge of 21s. 6d. a ton, and you will at once appreciate whether or not it is possible to supply American coal at anything like 25s. a ton." The speaker expressed the opinion that in a few months we shall come back to normal times, and America will be ousted from the field. Colonel W. P. Rend, of Chicago, who is a big operator in the American coal market, has different views. He says that, from inquiries he has made, he is more than ever satisfied that within a few years America will wrest from England the markets of the Mediterranean and the Far East. In his opinion, the advance in price is caused by the increase in English home consumption, and by the fact that the coal workings become more expensive each year. This, he says, is where America will reap its greatest advantage. Three tons of New River or Pocahontas coal can be produced as cheaply as one ton of Welsh.

A report reached England through the Central News Agency last Wednesday, to the effect that the Pittsburg and Baltimore Coal Company had accepted a contract to ship 75,000 tons of coal to this country; but on Friday nothing was known of the matter on the Coal Exchange. It was admitted that it was quite possible that one of the large railway or gas companies might have made such a contract; but it was agreed that it was not likely to affect London prices.

Since the possibilities of American supplies began to be talked about, the shipping companies have put up the freightage considerably, until now London merchants declare that it is absolutely impossible to trade for ordinary shipments. The South Metropolitan Gas Company were only charged 16s. per ton freightage for the cargo of coal. Supplies have also been received at Havre for some time past, with freightage at 17s. Now 21s. and even 26s. per ton are being demanded. The Liverpool correspondent of "The Times" says that, owing to the advance in the price of coal, the Canadian steam trade notify that they have arranged to make an advance of 10 per cent. on freight rates. This charge will be made on the bill of lading under the style of "coal primage, 10 per cent.," and was to take effect for all steamers leaving after the 8th inst.

The Birmingham correspondent of "The Times," writing on Friday, said: "Notices have been issued by the Cannock Chase coalowners of another advance in coal, to take effect from Monday. Manufacturing coal is to be increased 1s., and domestic fuel 1s. 6d. per ton. The announcement has occasioned much surprise among Midland ironmasters and manufacturers, who declare that in the present state of trade they are unable to obtain more money out of customers, and they will themselves have to bear the greater portion of the burden. Already one or two blast-furnaces in South Staffordshire have been damped down in consequence of the heavy prices of fuel and the resulting unremunerative business; and other ironmasters threaten to take the same course. It is argued by employers that a diminished demand is the only weapon that has the smallest prospect of success in fighting the colliery proprietors. An effort is to be made to secure united effort in bringing pressure to bear upon coalowners to compel them, if not to reduce their prices, to hold their hands a little. A very large number of householders are laying in stocks in anticipation of great scarcity during the approaching winter; but at present there is no cause for such an apprehension. The demand from iron-works is no doubt declining. Large consumers are reducing their purchases as much as possible; and, so far as demand is now concerned, it may be said that, in the opinion of those who should be able to judge, there is no real ground for the advances."

It will be of interest to hear what a colliery manager has to say on the question of the coal supply. The new President of the National Association of Colliery Managers (Mr. C. E. Rhodes, of the Rotherham Main Colliery), speaking at the recent annual meeting, said it had been stated that our coal was becoming rapidly exhausted, and that our children's children would feel the pinch; and, moreover, it had been suggested that the export of British coal should be stopped, or at least restricted. In his opinion, such a suggestion should never be entertained, except, possibly, with regard to Welsh smokeless coal, which was limited in quantity and invaluable for naval purposes. These collieries, he thought, should be purchased by the country. But to stop the exportation of other coal would be to reduce the means of livelihood of 600,000 persons.

Writing on Saturday, the Durham correspondent of "The Times" said: "Extending from Seaham Harbour along the Durham coast southwards about nine miles, close to Hartlepool, is an area of a rough triangular shape, some three or four miles wide at its broadest part, and enclosing what is practically the only portion of the Durham coalfield not opened up. Hitherto the great obstacle to the development of this district has been the lack of railway facilities; but the North-Eastern Railway Company have recently acquired powers for, and are pushing on, the construction of between nine and ten miles of line to be known as the Durham Coast Railway, from Hartlepool to Seaham. This has given great impetus to the preparatory work necessary to the opening out of collieries, with the result that the area indicated is now the field of great activity in mining operations—sinking of shafts, pumping, and the like. Several new shafts are in course of sinking, two of which are on Lord Londonderry's property, about a mile south of Seaham Harbour. They are close to the sea, are 20-feet shafts, and in all probability the workings will be chiefly under the bed of the sea. When completed, they will be very large collieries, with a considerable mining population. About three miles farther south, at Easington, very heavy sinking and pumping plant has been laid down; and over 100 workmen are actively engaged on behalf of the Easington Colliery Company, who propose to erect 1000 houses for pitmen and their families. Private enterprise will, no doubt, largely supplement this number as the collieries are developed. Here two shafts of 20 feet and one of 17 feet are being made; and as the situation is on rising ground within a mile of the seashore, this will not only be one of the largest collieries in the county, but probably one of the healthiest. Operations very similar in character and size are also being carried on a mile farther south, where the Harden Colliery Company have secured very extensive royalties. Practically in the same district, but some four or five miles north of Seaham, another new colliery is in course of formation at Hylton, near Sunderland. These various undertakings, when in working order (to attain which as rapidly as possible no effort is being spared) will, it is estimated, give a combined yield of about 5 million tons per annum—a very appreciable addition to the present output of the county of Durham. During the past week there has been a decided shrinkage in demand, as well as in price, for the classes of coal principally produced in Durham and Northumberland."

Mr. J. B. Fenwick, the Manager of the gas and water works of the Retford Corporation, has received an increase of £25 per annum in his salary in respect of each undertaking. The matter came before the Town Council at their last meeting, when Mr. Fenwick's industry and ability were strongly eulogized. The two Committees were quite unanimous in recommending the advance.

THE REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

The Constitution and Analysis of Ammoniacal Liquor.

In the notice of the last report of the Chief Inspector under the Alkali, &c., Works Regulation Acts (Mr. R. Forbes Carpenter) which appeared in the "JOURNAL" for the 28th ult., we mentioned that he had given therein the results of examinations made in the past year on the constitution of various ammoniacal liquors from English and Scottish sources, in continuation of the series recorded in his three preceding reports. This part of Mr. Carpenter's work was left to be dealt with on a subsequent occasion.

All the liquors reviewed in the first portion of the following table were derived from gas-works; no English coke-oven liquor having been examined this year. Nos. 2 and 3 are strictly comparable—the scrubbing and washing apparatus whence No. 3 was derived being supposed to be the superior in efficiency; but in both of these works the strengthening of the liquor in percentage of ammonia by repeated passage down the scrubbers is considered of great importance. The high percentage of sulphur as ammonium sulphocyanide will not escape notice. In dealing with this general table, Mr. Carpenter says it is only necessary to direct attention to the large percentage of fixed ammonia, as chloride, in No. 5, derived from carbonization of coals of the Midland districts of England, Nottingham, North Derbyshire, and South Yorkshire. The second portion of the table deals with liquors derived from the distillation of Scotch coals.

ANALYSES OF AMMONIACAL LIQUORS.

From English Works.

Liquor.	Degrees Twaddel.	Cyanide.	Chloride, calculated as HCl. per Cent.	Distribution of Sulphur (per Cent.).							Ammonia.				Carbonic Acid.		Sulphuretted Hydrogen.		Total Acids (B + C); H.E.	Difference of Acids (B + C − A) H.E.	Difference of Acids (B + C − A, NH_3, H.E. = 100).	Per Cent. of Total Acids as H_2S.
				As Sulphate.	As Sulphocyanide.	As Thiosulphate.	As Polysulphide and other Forms (by Difference).	As Sulphide.	Total Sulphur.	Sulphur to Ammonia.	Total—per Cent.	Fixed—per Cent.	Free. Per Cent.	Free. A. H.E.	B. Per Cent.	B. H.E.	C. Per Cent.	C. H.E.				
Gas-Works.																						
1	5·25	Absent	0·684	1·05	10 27	5·15	4·54	78·99	0·7350	31·49	2·3340	0·4210	1·9130	112·57	1·843	83·78	0·6169	36·29	120·07	+ 7·54	+ 6 70	30·2
2	8·00	,,	0·387	2·78	27·42	19·95	9 56	40·29	0·5252	18·40	2·8535	0·3825	2·4710	145·35	3·086	140·27	0·2354	13·85	154·12	+ 8·77	+ 6·03	9·0
3	8 75	Traces	0·568	2·43	25·33	15·79	4·01	52·44	0·5921	19·99	2·9623	0·4463	2·5160	148·00	3 058	139·00	0·3300	19·41	158·41	+10·41	+ 7 03	12·3
4	5·75	Absent	0·5475	3 62	37·71	15·59	4·00	37·08	0·4840	24·02	2·0145	0·4420	1·5725	92 50	1·873	85·15	0·1908	11·22	96·37	+ 3·87	+ 4 18	11 6
5	5·75	,,	0·952	2·64	27 80	18·92	9·48	41·16	0·4620	22·11	2·0893	0 6545	1·4348	84·40	1·705	77·50	0·2021	11·89	89·39	+ 4·99	+ 5 91	13·3
From Scotch Works.																						
Gas-Works.	3·50	Traces*	0·145	1·82	19·65	10 64	−21·77	89·66	0·0987	7·73	1 2540	0 1280	1·1260	66 24	1·294	58·82	0 094	5·53	64·35	−1·89	− 2·85	8 6
Coke-Ovens—																						
(*a*)	2·00	,,	0·113	1 26	3·32	12·23	1·04	79·15	0·1055	9 65	1·0931	0 0965	0 9966	58·62	1 0970	49·86	0 0887	5·22	55·08	−3·54	− 6·04	9·5
(*b*)	2 75	,,	0 15	8·28	3·27	24·44	−4 19	68·20	0·0978	9 65	1·0132	0·1190	0·8942	52 59	0 9116	42 80	0·0667	4·17	46·97	−5 62	−10·69	8·9
Iron-Works	2·50	Absent	0·010	..	..	70 97	..	..	0·0031	0·75	0·4138	0·0068	0·4070	23·94	0·6023	27·37	Absent	..	27 37	+3·42	+14·33	..

* And faint traces of ferrocyanide. In all other cases the latter was absent.

Dealing with the conditions of oxidation of ammonium sulphide in liquors, Mr. Carpenter states that, by the courtesy of the Manager of the works whence sample No. 1 in the above table was derived, further experiments were made with the view of ascertaining, as far as possible, at what point in the process of condensing, washing, and scrubbing the oxidation of ammonium sulphide to thiosulphate proceeded with the greatest rapidity. He chose these works especially for study as he knew that for a great many years past air in a proportion limited to a volume not exceeding 2 per cent. of that of the crude gas was regularly mixed with the latter at a point preceding the washing and scrubbing apparatus, but subsequent to, or at the end of, the condenser. What condenses in the latter apparatus is called "virgin liquor;" and this, together with that resulting from the final operation of the scrubbers, fed with fresh water, is pumped on to the washers (which, with the exception of the exhausters, immediately succeed the condensers), in order to be raised up to the proper ammoniacal strength, and still further purify the gas from sulphuretted hydrogen and carbonic acid. The salient conditions in the condenser may be said to be high temperature and a minimum of oxygen, and in the washers and scrubbers low temperature and a maximum of oxygen. As the object of adding the air is to obtain continuous revivification of the oxide of iron purifiers employed for final purification of the gas, any oxygen absorbed in the washers and scrubbers is, so to speak, put out of action. He also knew that the Manager obtained singularly successful results with his Claus sulphur-recovery process in connection with his sulphate of ammonia plant, and wanted all ammonia combined with sulphur as sulphide, and none in an oxidized form.

Samples of (1) virgin liquor, (2) scrubber liquor, and (3) store-tank liquor as flowing from the washers were sent to Mr. Carpenter, with particulars of the temperature of the gas at different points, and the relative volumes of "virgin" and scrubber liquor. The points requiring attention are set out in the following table:—

Liquor.	Temperature of Gases.		Liquor Leaving Condenser.		Remarks.
	Entering.	Leaving.	Thiosulphate as Sulphur.	Sulphide as Sulphur.	
	Deg. Fahr.	Deg. Fahr.	Grammes per Cent.	Grammes per Cent.	
Condenser .	110	60	0·064	0·165	"Virgin" liquor condenses here; 12 gallons per ton of coal carbonized.
Scrubber .	60	60	0·034	0·736	Clean water feed; 13 gallons of liquor 2° Tw. per ton of coal carbonized leaves this scrubber.

Mr. Carpenter says the figures show that $12 \times 0{\cdot}064 = 0{\cdot}768$ and $13 \times 0{\cdot}034 = 0{\cdot}442$ give the comparative rates of formation of thiosulphate at the condenser and scrubber; and that the ratio of what, in the absence of direct oxygen determinations, he must (provisionally only) assume to be oxidation in the condenser—*i.e.*, the ratio of thiosulphate to sulphide—is 1 to 2·58, and in the scrubber 1 to 21·65. Temperature, therefore, seems much the more important factor, and very little action of the air has had time to take place in washers and scrubbers; the sulphur as thiosulphate in the final process only amounting in all to 5·15 per cent. of the whole. This investigation is, however, not complete; and Mr. Carpenter hopes to present more conclusive results from further investigations in the present year. In the two works whence samples Nos. 2 and 3 were derived, the influence of time on oxidation, even at low temperatures, is apparent. Mr. Carpenter was informed by the Manager from his works' records that the temperatures of the liquors vary from 62° to 74° Fahr.—not being sensibly different from that of the gas scrubbed. He says it is necessary to recognize as a possible reaction contributing to the general result that thiosulphate may be formed as follows:—

$$4(NH_4)_2SO_3 + 2(NH_4)_2S = 3(NH_4)_2S_2O_3 + 6NH_3 + 3H_2O$$

but it is not probable that during the charging of the retorts much sulphurous acid can be formed when the limited time of this operation is taken into account.

Passing on to the subject of the analysis of ammoniacal liquors, Mr. Carpenter points out that some account of the methods adopted in his laboratory were mentioned in his report for 1896. The experience since gained in the application of these methods to a variety of liquors from many sources has, he says, led to some modification of procedure, with increase of accuracy. In the earlier stages of the investigation, no method was known to him by which the sulphur present as thiosulphate in such liquors could be directly determined, as the colour end change with standard iodine was invariably masked by the organic matter present. A method of estimating thiosulphate by difference had therefore to be relied upon, which allowed no distinction to be drawn between the sulphur present as thiosulphate and that present as polysulphide or other forms. The difficulty has now, however, been satisfactorily overcome by the use of hydrochloric acid in place of acetic acid during the titration of the thiosulphate by iodine, by which means the action of the phenoloid bodies upon the latter is so far retarded as to allow the first appearance of the blue iodide of starch to be determined with approximate exactness. The thiosulphate figure so obtained must, however, he points out, be regarded as a maximum figure, since the reduction of the iodine by organic matter, though retarded, can never be entirely prevented, even by the presence of a strong mineral acid. The method is nevertheless sufficiently exact to allow interesting conclusions to be drawn from a comparison between the figure directly obtained in this way and that derived indirectly by the "difference" method already referred to. In general, it is found that while there is close agreement between these two figures in the case of coke-oven liquors and those derived from blast-furnace gases, marked divergence occurs when liquors from gas-works are examined; the "difference" figure being so constantly the higher of the two as to leave no room for doubt that sulphur is present in considerable amount, certainly as polysulphide, and possibly in oxidized forms other than those of thiosulphate or sulphate. Mr. Carpenter sets out the special methods now in use in these investigations, and concludes by saying that ammonia (free and combined) is determined in the usual

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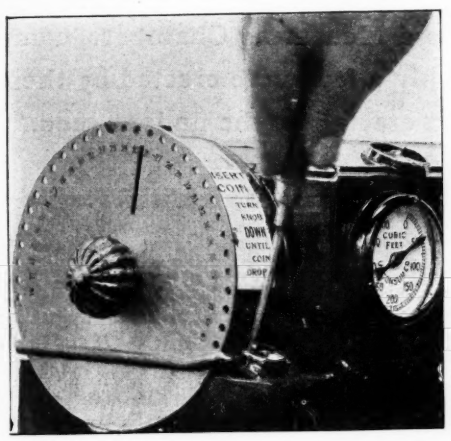

Fig. I.
Break Company's Seal and Remove Screw—THUS.

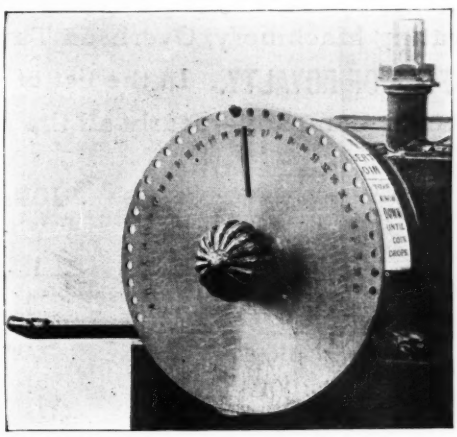

Fig. II.
Swing Band Back—THUS.

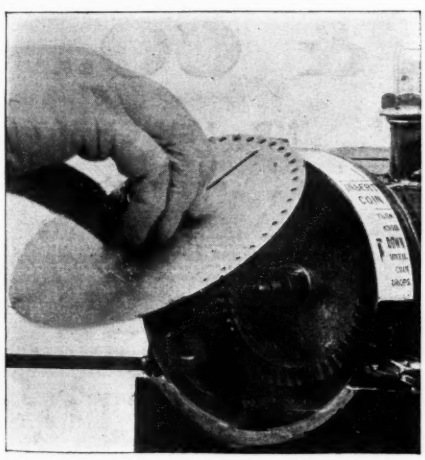

Fig. III.
Lift Plate Off—THUS.

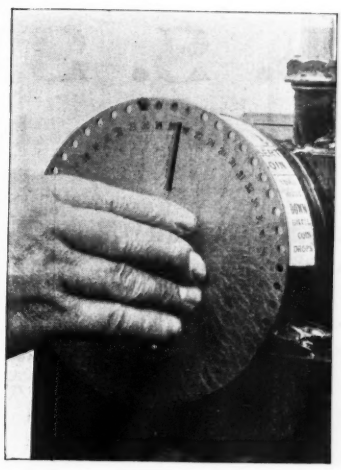

Fig. IV.
Replace Plate—THUS.

Swing Band Forward—Replace Screw—and Re seal.

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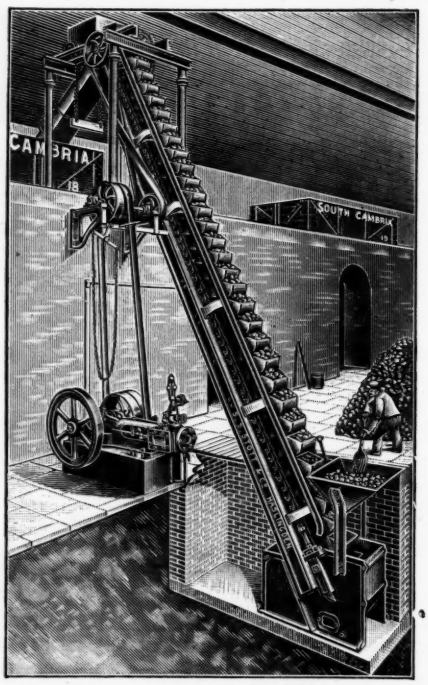

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way by distillation; caustic soda being employed to liberate the fixed ammonia.

An interesting section in Mr. Carpenter's report to the Chief Secretary for Scotland is that in which he furnishes details of certain experiments carried out in connection with methods of treating foul gases evolved in the manufacture of sulphate of ammonia from gas liquor. He begins by reminding the Chief Secretary that, having regard to the differences of constitution and to the special difficulties presented by the nature and proportions of the foul gases evolved in the manufacture of sulphate of ammonia from liquors derived from the carbonization of coal in large or small quantities, he stated last year that his attention had been directed to other chemical methods than those in use in England for treating sulphuretted hydrogen. Laboratory experiments were made in the spring on the inquiry to which Mr. Curphey had directed his attention; being the application to ammoniacal liquors containing ammonium sulphides and hydrosulphide of the method of using binoxide of manganese and air in conjunction to decompose the sulphur compounds with separation of sulphur—the process being made continuous.

He expresses regret that, though conditions were varied greatly, and made as favourable as possible for the desired reactions, yet success did not attend his efforts. But as the history of failures is often quite as instructive as that of successes, he does not scruple to set out this particular one in a little more detail. In his report for 1898 he wrote: "The reactions desired might be set out somewhat as follows:—

$$(1)\ MnO_2 + H_2S = H_2O + S + MnO$$
$$(2)\ MnO + O = MnO_2$$

And with ammonium sulphide—

$$(3)\ MnO_2 + 3(NH_4)_2S + 2H_2O + 5O = MnO_2 + 4NH_4OH + S + (NH_4)_2S_2O_3$$

an equation which must be only taken to indicate partial oxidation to thiosulphate and partial separation as free sulphur."

Being somewhat prepared beforehand for salts of ammonia exercising a retarding effect on oxidation, even with ample access of air to solutions in which precipitated protoxide of manganese is suspended, it was thought better to test separately the action on binoxide of manganese suspended in solution of (*a*) sulphuretted hydrogen in solution, air being supplied, but carbonic acid being absent; (*b*) sulphuretted hydrogen and carbonic acid in the gaseous state, together with air, in the proportions likely to occur in practice; (*c*) the same, with carbonate and bicarbonate of lime present in the converter with the binoxide of manganese; and (*d*) sulphuretted hydrogen in solution, air being supplied, carbonic acid being present in the converter in the form of various salts, manganese being present as binoxide and as carbonate. The reactions were so unsatisfactory as not to make it worth while to introduce the additional retarding agent ammonia.

Mr. Carpenter's assistant (Mr. Linder) devised apparatus of great ingenuity so as to test these reactions in every possible way, noting all factors that would be of importance in converting a laboratory process into a working method on the large scale. The apparatus consisted of a decomposer and a converter, and the results are set out as follows:—

(*a*) *Absence of free lime.* Sulphuretted hydrogen in solution was run into the converter containing manganese binoxide in suspension in water through which a large excess of air was passing. Sulphide of manganese formed. At the conclusion of the experiment, the temperature of the liquor was raised to 55° C., and the current of air continued for 20 minutes, without causing any darkening of the sulphide.

(*b*) *Carbon dioxide in the gaseous state.* A mixture of sulphuretted hydrogen and carbon dioxide was passed, together with excess of air, through manganese binoxide suspended in water. The binoxide was reduced to a white compound, very stable in presence of air, presumably carbonate of manganese; some manganese also being in solution. Sulphide of manganese separated on standing.

(*c*) *Calcium carbonate and bicarbonate present.* A mixture of sulphuretted hydrogen and carbon dioxide was passed, together with excess of air, through water containing carbonate (and bicarbonate) of calcium and manganese binoxide in suspension. The binoxide was reduced to a white compound, very stable in presence of air, presumably carbonate of manganese; some manganese also being in solution. Sulphide of manganese separated on standing.

(*d*) *Carbon dioxide in the form of various salts.* (1) Bicarbonate of soda in excess. Sulphuretted hydrogen in solution was run into a solution of bicarbonate of soda containing binoxide of manganese in suspension through which a large excess of air was passing. A white residue was obtained, which resisted re-oxidation. No manganese in solution. (2) Manganese binoxide replaced by manganese carbonate. Sulphuretted hydrogen in solution was run into water containing recently precipitated carbonate of manganese in suspension through which a large excess of air was passing. The carbonate remained quite white. No manganese was found to be in solution. At the conclusion of the experiment, the current of air was continued for 35 minutes at the temperature of the laboratory without causing any darkening of the suspended solid.

(*e*) *Free lime present—carbon dioxide absent.* Sulphuretted hydrogen with excess of air was passed through water containing free lime and binoxide of manganese in suspension. Oxidation of the sulphuretted hydrogen proceeded rapidly. It was easy to regulate the proportion of peroxide of manganese to protoxide in the solution by means of the air supply, no sulphide of manganese being formed.

In one experiment, a quantity of sulphuretted hydrogen equivalent to 1·89 grammes of sulphur entered a converter, containing 2 grammes of oxide of lime and 1·04 grammes of manganese binoxide, in 100 minutes. At the conclusion of the experiment, a sample of the contents of the converter was withdrawn for analysis. A current of air was then passed through the converter for a further period of 90 minutes. After 100 minutes, the liquor contained—

Sulphur as thiosulphate	0·6304 gramme.
,, sulphuretted hydrogen	0·0160 ,,

Calcium sulphate and free sulphur not determined.

On continuing the air current alone for a further 90 minutes, the result was—

Sulphur as thiosulphate			0·3000 grammes.
,, sulphuretted hydrogen			
(*a*) In converter	0·0000 gr.		
(*b*) In iodine catch	0·0024 ,,		
		0·0024	,,
,, sulphide of manganese		0·0000	,,
,, free sulphur		1·3000	,,
,, calcium sulphate (by difference)		0·2876	,,
Total		1·8900	grammes.

The preliminary experiments this year were made in the laboratory, allowing the liquors to descend a little scrubber maintained at a temperature of 125° Fahr., or thereabouts, by means of a warm water-jacket. Air in measured volume was aspirated through the scrubber; and after circulating the liquors for a definite period of time, a balance-sheet was prepared, showing (*a*) what change had taken place in the solutions originally employed, and (*b*) what proportions of sulphuretted hydrogen and of ammonia were found carried away by the current of air and arrested in the final catch-vessels.

Experiments were also made with liquors to which sulphurous acid solution in known quantity had been previously added; but as the introduction of this factor seemed distinctly to exercise on the ultimate oxidation of the sulphide a retarding effect, instead of accelerating it, these were soon discarded. Certain curious features were noted, however, in the disappearance of sulphur when the balance-sheet came to be made up. At the time these appeared unaccountable; but, as mentioned in Mr. Carpenter's report to the Local Government Board, a clue was found in the separation of sulphur from the polysulphide originally present. He hopes to say more about this reaction in next year's report. He found, however, that on the small scale of laboratory apparatus conclusions could not be drawn with sufficient accuracy as to the influence of the time factor on reaction. If left standing for any length of time, oxidation of liquor took place in the apparatus itself even when hermetically sealed; the volume occupied by the air being out of all proportion to that which would obtain in a larger scale experiment on a greater volume of liquor. On studying these preliminary results, he decided that no more definite progress could be looked for on these lines.

It then became Mr. Carpenter's desire to try the reactions on a small manufacturing scale with a scrubber or oxidizer of fair dimensions; allowing time for the descent of the liquor sufficient to observe results on one, or at any rate two, calculations. Through the courtesy of one of the leading gas-works engineers, plant was erected for him in the autumn, and every possible assistance was given to Mr. Linder in the experiments conducted by him with so much united skill and zeal. The liquor dealt with was, approximately of the constitution of the first sample given in the following table:—

TABLE *of Inlet and Effluent Liquors.*

Liquor.	Degrees Twaddel.	Cyanide.	Chloride calculated as HCl. per Cent.	Distribution of Sulphur (per Cent.). As Sulphate.	As Sulphocyanide.	As Thiosulphate.	As Polysulphide and other forms (by difference).	As Sulphide.	Total Sulphur.	Sulphur to Ammonia.	Ammonia. Total—per Cent.	Fixed—per Cent.	Free. Per Cent.	Free. A. H.E.	Carbonic Acid. B. Per Cent.	B. H.E.	Sulphuretted Hydrogen. C. Per Cent.	C. H.E.	Total Acids (B + C); H.E.	Difference of Acids (B + C − A) H.E.	Difference of Acids (B + C − A, NH_3, H.E. = 100).	Per Cent. of Total Acids as H_2S.
Inlet liquor . . 1 cubic foot of air and 1 gallon of liquor per minute.	3·5	Traces*	0·145	1·82	19·65	10·64	†−21·77	89·66	0·0987	7·73	1·2540	0·1280	1·1260	66·24	1·294	58·82	0·0940	5·53	64·35	−1·89	−2·85	8·60
Effluent liquor . Temperature, 148° Fahr.	3·5	Absent	0·184	6·70	18·45	49·12	+24·20	1·53	0·0851	6·57	1·2390	0·1490	1·0900	64·12	1·107	50·32	0·0014	0·08	50·10	−13·72	−21·39	0·16

* Also faint traces of ferrocyanide.
† Negative signs mark the interference of organic matter with the estimation of sulphide and thiosulphate by iodine.

The results are given in gallons per minute flow down the scrubber, which was 3 feet in diameter and 12 feet in height, with an available scrubbing space of 78 cubic feet, filled with bundles of wood shavings so packed as to present the greatest possible surface. The interior of the scrubber was provided with a coil of close steam-pipe in its lower area, so that cold liquor might be fed on the top portion, and reactions proceed,

if so desired, with a cold top zone and a hot bottom zone, and also for use as a regulator of temperature in all experiments if needful. Air was blown through a meter, and so measured in cubic feet per minute. When the conditions had become constant, the effluent gas was sampled for carbonic acid, oxygen, ammonia, and sulphuretted hydrogen. In one instance the oxygen was reduced per 100 volumes of escaping gas to 4·5—carbonic acid being 9·5 and sulphuretted hydrogen 0·3. As air contains by volume 21 per cent. of oxygen and 0·04 per cent. of carbonic acid, the reaction in abstraction of the former and addition to the latter is very notable. The change of darkening in colour in the liquor was marked; much oxidation of the organic matter taking place, as the abstraction of oxygen was decidedly greater in amount than that required for simple oxidation of the sulphur present combined with ammonia to the extent indicated by subsequent analysis. One reaction definitely suggested by these tests and experiments was that polysulphide of ammonium was present, from which sulphur separated in the free state. In large scale operations, sulphur has been found to deposit freely in the tubular liquor heaters when strong gas liquor is heated to a temperature of 170° Fahr., necessitating stoppage for clearing. This can only have come from decomposition of polysulphide of ammonium.

In translating these results into large-scale practice, it would have to be recognized that an acid ammonia catch would be needed to prevent loss of this body when carried away by the gases leaving the scrubber, and that these latter must be finally dealt with by an oxide of iron purifier, or by combustion, to destroy the last traces of sulphuretted hydrogen invariably present to some extent. Any gas-works engineer knowing the constitution of his gas liquor would, on the basis of these experiments, be able to construct a plant to make the oxidation of the sulphides in the liquor treated a continuous working process. Or if he chose to circulate given quantities of liquor—*i.e.*, to prepare one day the liquors to be used for sulphate manufacture on the succeeding day—smaller scrubbing plant would be required; but very much more precaution would have to be used to prevent loss of ammonia from the circulated liquor, heated as it would be to a temperature of about 150° Fahr. The heat needed to raise the liquor to this temperature can easily be obtained from the sulphate plant condensers when sulphate manufacture is in progress; but it would have to be supplied from some other source were the two processes disconnected from each other.

The next proposal taken up was indicated in Mr. Carpenter's report for 1898—viz., to adapt the Claus sulphur-recovery method of treatment of the foul gases to Scotch conditions by supplying a jacket of waste heat to the kiln to promote reaction, or at any rate to prevent loss of heat by radiation, and so maintain a reaction once started. It was thought desirable to test this on a fairly large laboratory scale—the cylindrical jacketed Claus kiln being 13 inches in depth and 6 inches in diameter. Considerable thought and trouble were expended before a satisfactory apparatus was attained.

The heat-jacket was supplied by the products of combustion from a bunsen burner placed below the kiln. The direct action of heat on the bottom of the kiln could only affect the gases after these had passed the zone of reaction in the active portion of the kiln above the false bottom, 4 inches higher than the actual bottom. The diameter being 6 inches, the sectional area was 28·27 square inches. At first, the depth of material was 7 inches; the top 2 inches being fine material. The sulphiding of this, however, was so long a process that a start *de novo* was made with about 2½ inches, chiefly fine material—an available decomposing mass, therefore, of about 70 cubic inches. When sulphided, gas of about 8 to 12 per cent. sulphuretted hydrogen (the 92 to 88 per cent. being carbonic acid) was passed through with air in excess of that necessary for combustion to water and sulphurous acid, at the rate of about 600 cubic centimetres mixed gases per minute. The air was estimated at a minimum of five volumes of air to one volume of sulphuretted hydrogen—*i.e.*, twice that necessary by theory to obtain separation of all the sulphur in the free state. This proportion was raised in subsequent experiments to frequently four times that required by theory, yet, in the case of manganese oxides, without increase of sulphurous acid when temperatures were kept low.

The temperature of the contact substance in the kiln was recorded on a thermometer specially constructed for use at the temperatures employed. The heat of the jacket required to replace that lost by radiation and that carried away by the gases was also regulated by observing this thermometer. Translating this rate of flow into cubic feet of gas per minute per square foot of area of contact substance, the figure 0·106 was arrived at. This was subsequently largely increased, both when oxide of iron was employed as the contact substance, and even more when oxides of manganese in the form of washed Weldon Mud were employed. As in some works using the Claus process broken brick in place of oxide of iron is employed—successfully, it is stated, if the temperature of the kiln is maintained sufficiently high—the experiments were extended to include broken brick as a contact substance. At low temperatures its efficiency is far inferior to both manganese and iron oxides; but this inferiority lessens as the temperature in the kiln is increased.

Mr. Carpenter sets out, in tabular form, the results of his experiments on the oxidation of gas liquor by air and on the reaction of dilute sulphuretted hydrogen with different contact substances, and then gives the following synopsis of conclusions drawn therefrom:—

A.—*Oxide of Manganese as Contact Substance.**

(*a*) Rise of temperature (350° to 500° Fahr.).
"Free sulphur" disappears, being replaced by sulphur in the form of sulphur dioxide.

(*b*) Increased rate of flow (800 to 3000 c.c.).
Causes little change in composition of exit gas.
Reactions on the whole characterized—
(i.) At temperatures below 400° Fahr. by formation of "free sulphur."
(ii.) At temperatures above 500° Fahr. by formation of sulphur dioxide.

B.—*Oxide of Iron as Contact Substance.**

(*a*) Increased rate of flow (1000 to 2000 c.c.).
Distinct increase in percentage of sulphur as sulphuretted hydrogen in the exit gases.

(*b*) Decreased air supply.
Distinct increase in percentage of sulphur as sulphuretted hydrogen in the exit gases.
Reactions on the whole characterized by formation of sulphur dioxide rather than that of "free sulphur."

C.—*Broken Brick.*

(*a*) Increased rate of flow (700 to 2500 c.c.).
Causes distinct increase in percentage of sulphur present as sulphuretted hydrogen in the exit gases.

(*b*) Rise of temperature (300° to 500° Fahr.).
Causes distinct decrease in percentage of sulphur present as sulphuretted hydrogen, and increase of that present as sulphur dioxide in the exit gases.
Reactions on the whole characterized by a large amount of sulphuretted hydrogen escaping unoxidized, and by formation of "free sulphur" in place of sulphur dioxide.

* Carefully sulphided before use.

Mr. Carpenter hopes in the course of the current year to be able to see this reaction at work on the large scale at an important works in Scotland. Provision is being made for dealing with the sulphurous acid formed by means of a limestone tower in the way usual in the Claus sulphur process as applied in English gas-works—the tower immediately succeeding the sulphur catch chamber. Provision is also made for dealing with any unconverted or re-formed sulphuretted hydrogen, so as to prevent escape of this into the atmosphere.

Here we conclude our notice of Mr. Carpenter's report, which, as readers will have gathered, is full of varied and interesting matter.

STATISTICS OF AMERICAN GAS UNDERTAKINGS.

The report of the United States Commissioner of Labour upon gas, water, and electric lighting plants for the past year has been issued, and is briefly noticed by our contemporary "Progressive Age." There are altogether 355 works dealt with, 11 of which are owned by municipalities. The following table shows the average cost of production per 1000 cubic feet of gas made. In its compilation, the value of the residuals has been deducted from the cost of the coal before calculating the averages. The fixed charges include depreciation, taxes, and the interest on the total investment.

Annual Output. Million Cubic Feet.	Private Plants.			Municipal Plants.		
	Number Reporting.	Excluding Fixed Charges.	Including Fixed Charges.	Number Reporting.	Excluding Fixed Charges.	Including Fixed Charges.
Under 2	10	$1·86	$3·71	1	$2·26	$3·34
2 to 5	69	1·18	2·17	2	0·69	1·18
5 ,, 10	63	0·98	1·84	2	0·82	1·51
10 ,, 15	43	0·79	1·44	..	..	..
15 ,, 20	45	0·78	1·52	2	0·60	0·96
20 ,, 25	23	0·78	1·35	1	0·68	1·03
25 ,, 50	38	0·78	1·25	1	0·55	0·91
50 ,, 75	17	0·65	1·14	..	..	..
75 ,, 100	9	0·61	1·06	..	..	..
100 ,, 500	18	0·45	0·92	2	0·44	0·63
500 or over	8	0·46	0·76	..	..	..

MUNICIPAL FINANCE AT SALFORD.

The Accounts of the Gas, Electricity, and Water Departments.

The abstract of the municipal accounts for Salford for the year ended March 31 last has been prepared by Mr. John Elliott, the Borough Treasurer. The several revenue accounts show that five of the departments have a total deficiency of £33,645. Against this, other departments show a surplus of £45,110; leaving a net surplus on the year of £11,465. Of the trading departments of the borough the gas-works have, as usual, been the most satisfactory. As a result of the year's working, the Gas Committee have been enabled to hand over £32,153 in relief of rates; being £5686 in excess of the profits for the previous year. The receipts during the year from the sale of gas and the rental of stoves amounted to £152,447—an increase of £12,927 over the previous twelve months. The revenue from the sale of residual products shows a rise of £15,637; making a total of £28,564. Against this has to be placed an increase of £16,644 in the cost of the manufacture of gas, and of £6233 in depreciation, sinking fund, and miscellaneous charges. In the Electricity Department there is a loss of £2028 on the working for the year, mainly caused by the amount of interest on loans and sinking fund contributions, owing to the capital expenditure on works undertaken to supply the future requirements of the borough. These will be large, as shown by the fact that the revenue from the sale of electric current has increased by £2538, compared with the previous year. The Water Committee have placed £2201 to the credit of the district fund in aid of the rates as the result of the year's working, being a decrease of £1477 as compared with the surplus of the previous year. Salford is dependent upon Manchester for water supply, and during the past financial year the sum of £19,289 was paid to the Manchester Corporation for water supplied in bulk, ranging from 3d. to 9d. per 1000 gallons. Although there has been an increased payment to the city of £1447 for water supplied, the receipts on account of rentals have only risen by £734. The mortgage debt of the borough increased during the year by £179,510, and now stands at £2,186,307. The balance of assets over liabilities has gone up by £68,579; and the total now stands at £813,312.

The Directors of the British Gaslight Company, Limited, recommend a dividend at the rate of 10 per cent. per annum (free of income-tax) for the half year ending the 30th of June.

MANCHESTER GAS, ELECTRICITY, AND WATER SUPPLY.

At the Meeting of the Manchester City Council held last Wednesday, the minutes of the Gas, Electricity, and Water Committees were approved without discussion.

The chief items of interest in connection with the gas undertaking were the fact that the Finance Committee had instructed the City Treasurer to allocate loans to the amount of £100,000 to the gas account, and that plans of new offices, &c., for the foremen at the Rochdale Road station, prepared by the Engineer (Mr. J. G. Newbigging), had been approved—the work to be carried out by the Committee's own men.

Among the resolutions submitted by the Electricity Committee was a recommendation that a draft agreement be sent to the Urban District Council of Prestwich for transferring their Electric Lighting Order to the Corporation, and that the Town Clerk be instructed to take the necessary steps for obtaining the approval of the Board of Trade.

The minutes of the Water Committee contained a resolution approving of a report to the Thirlmere Sub-Committee by the Engineer (Mr. G. H. Hill), as to arrangements for laying a second pipe in connection with the Thirlmere aqueduct. From the experience of the working of the present syphons, which were 40 inches in diameter, and looking to the reduction in discharge by the pipes from sedimentation and increased friction as time went on, it was recommended that the second line of pipes should be 44 instead of 40 inches, and 40 inches where it is now 36 inches. By the adoption of this course, all conting-ncies would be fully provided for. Having been requested by the Committee to take into consideration the question of adopting steel instead of cast-iron pipes, the Engineer had thoroughly considered the matter, and had come to the conclusion that it was desirable to adhere to the use of the former material in preference to the latter. The cast-iron pipes for the portion of the aqueduct to be first commenced should be provided as soon as possible. In consequence of the present high price of iron, it would probably be desirable to let the piping in several contracts, as almost all pipe makers were at present very full of work, and might not be able to supply more than a limited quantity. Judging from the time taken for the delivery of the existing line of pipes, the Engineer thought the pipes now required, divided into four or five contracts instead of two, might be obtained in two years. When the preparations for the letting of the contract for the cast-iron pipes were completed, a separate one could be prepared for the steel pipes, which he recommended to be used in the subways and across some of the bridges. This would be a comparatively small contract. Experience led him to recommend that the same methods of inspection and supervision which were followed in the provision of the first pipe, and which were found to be eminently satisfactory, should be adopted for the second. The first pipe had proved to be an exceptionally sound one. Having discussed with Mr. Barnett (who was engaged on the construction of the works about eight years) the best mode of carrying on the work, he had come to the conclusion to advise the Committee to let the pipe-laying by contract; stringent provision being made in the conditions for the protection of the present pipe.

GLASGOW CORPORATION GAS SUPPLY.

The Gas Accounts Adopted.

At a Meeting of the Corporation of Glasgow last Thursday, Mr. R. M. Mitchell, the Convener of the Gas Committee, moved the adoption of the annual accounts of the Department, a summary of which was published in the "Journal" for Aug. 14, p. 422. He said that the increased price of coal involved an additional expenditure of between £140,000 and £150,000 for the quantity required for the year on which they were now entering. To meet this, an increase of 6d. per 1000 cubic feet in the price of gas would have been required, but for the fact that, during the past year, they had benefited by an advance in the price of coke, while they had also been receiving a very good return from their residual products. Accordingly, instead of asking the citizens to pay this year an increase of 6d., which might fairly have been imposed, the Committee had decided to fix the price at 2s. 6d. per 1000 cubic feet—an increase of 4d. as compared with last year. How they would come out at the end of the year it was too early to say; but perhaps after this year they might be able to get contracts for coal at something like the old figure, when the present exceptional circumstances had passed away. This was only the second time within 16 years that the price of the gas had been raised. In 1884, when he entered the Council, the price was 3s. 10d.; and since then, with one exception—in 1892 93, when there was an increase—it had been reduced every year till it reached 2s. 2d. Even with the present increase, it was less than half the cost when the undertaking was acquired by the Corporation. In these circumstances, he did not think the citizens had any great reason to complain; and at present—in view of the general prosperity which all classes had had for some time—they could well afford a small increase for one year in the price of gas. The new works were in a very satisfactory state, and they owed a great debt of gratitude to their Engineer, Mr. Foulis, for the excellence of the plans he had designed for their new undertaking. Mr. Foulis was a patient, hard-working, painstaking Engineer, who devoted his life to making his department a success; and in this he had succeeded. In conclusion, Mr. Mitchell formally moved that the price of gas be increased to 2s. 6d. per 1000 feet; and he expressed the hope that by-and-bye they might be able to go back to something like the present price of 2s. 2d.

Mr. Battersby said that, while the citizens were deeply grateful to the Committee for the very low figure at which they had kept the price of gas, and for the fact that the charge was lower than it was 16 years ago, still they had expected that, in proportion as the population increased, the price of gas should decrease—the same as was the case in regard to the charge for water. He noticed there was a leakage of 569 million cubic feet, or 9 per cent. of the gas produced. He wanted to know if nothing could be done to prevent this. He was inclined to think that the fact that an increase of 4d. was proposed in the price of gas hardly spoke for the skill, power, and penetration of the Committee.

Mr. Stewart said he understood that the Gas Committee were negotiating for a coal mine, and that a report on it was made to the Committee, although the Council had not heard anything about it or given them any remit on the subject.

Mr. Burt thought it was a very serious matter that the citizens had to face an increase of 4d. in the gas-rate; but in the circumstances, he did not see how it could be avoided. However, he thought they should look a little forward. He believed a solution of the difficulty was to be found in a reduction of the candle power of the gas. The Corporation had not followed the examples of the English companies and corporations by adopting their standard, which was lower than the standard in Glasgow. The result of their maintaining the high quality was that it was necessary to purchase expensive cannel coal, which was being rapidly worked out, or was practically unprocurable except at a ransom price—a cost which was quite out of proportion to the value of the gas obtained. The citizens would have very much better value for their money if the candle power were lower. Another advantage of using a lower quality of coal would be that there would be a much better quality of coke. Coke in England brought a very much higher price than it did in Glasgow.

Mr. Mitchell, in replying, said there was no doubt leakage took place; but it was being decreased as much as possible. When the Corporation took over the gas-works, the leakage was as high as 18 per cent.; now it was about one-half that. He was very glad the Committee had contracted for their coal so long ago as May; because they could not now buy the same quality except at an increased price of 1s. per ton. It was quite true that American coal could be brought to this country; but he did not think there was any chance of it competing in price with Scotch coal. In regard to what had been said about the candle power of Glasgow gas, Mr. Foulis had not thought it necessary to come before the Council with any proposal for a reduction. In course of time the Committee might be driven to make such a proposal, when the coal of which Mr. Burt spoke became more scarce, or even extinct. No doubt the gas would be cheaper for heating, and especially for motive power, in which Mr. Burt was interested. There had certainly been a proposal to acquire a coal mine. A self-constituted Committee (but an intelligent and reasonable Committee for all that) made a proposal, and had got a report from some mining engineers. After the reports were discussed by the Committee, it was thought desirable not to pursue the subject any further.

The accounts were then adopted.

ABERDEEN CORPORATION GAS SUPPLY.

The Accounts for the Year.

At a Meeting of the Aberdeen Corporation on Monday last week, Mr. Kemp, the Convener of the Gas and Electricity Committee of the Corporation, in submitting the gas accounts for the year ending the 31st of July, said: The revenue from the sale of gas has risen £3891; from coke, £2188; from tar and ammoniacal liquor, £2363; while that from cyanogen is at a standstill, owing to the war in South Africa. The amount received from house services is down by £797; but so is the corresponding entry on the other side. Revenue from gas-stoves is up £74; but, as will be seen from the other side, the expenditure is treated as the same amount, the balance being always written off as depreciation. Revenue from rents and feu duties is nominally down £32—the real revenue being practically the same as before; but there has been considerable exceptional outlay in putting a water service all through the grounds for the use of our tenants, the Gallowhill Plotholders' Association. The total revenue for the year has risen £7181. Looking at the expenditure, coal has risen by £8304, purifying materials by £286, salaries by £35, wages of stokers by £1541, and horse and stable account by £283; while maintenance of plant has fallen £349. The total expenditure in connection with the manufacture of gas has risen £10,259. Under the head of distribution of gas, there is an increase of £883. Rents, rates, and taxes are up £508; expenditure on management has risen £35; while general charges are up £127; discounts are up £262; and bad debts have increased by £130. The total expenditure has risen £11,352; and as the revenue only rose £7181, the balance carried to net revenue account is therefore £4171 less than that carried the previous year. Turning to net revenue account, payments of annuities are £165 down, interest and mortgages are £52 up, and sinking fund for redemption of mortgages is £90 up; the balance carried down being £489, as against £4138 the previous year. It is always interesting in dealing with accounts, especially those of a manufacturing concern, to compare them with the results of the previous year, and ascertain why these results are as they are, and not different. Reference to the former year's accounts will show that there was a net balance in the year 1898-99 of £4138. To this there fell to be added a balance of £5864 belonging to previous years' accounts, which the Committee of that day had kept in hand. These together give £10,002, as shown in this year's accounts. Now, alongside this apparent free balance of £10,000, there are several serious elements affecting it that cannot be readily got at otherwise than on an occasion like the present, when we are dealing with results and their causes. In submitting the accounts for last year, I reminded the Council that the former Committee had left the present Committee the following legacies: Coal contracts for this year's working at an increase in cost to the tune of £5500. They had also raised the wages bill of the employees, which I modestly stated then at £500, but which has turned out over £800. In addition to this, the former Committee, in the exercise of their judgment, and in the hope of a fall in the price, had under-contracted for some 3000 tons of coal; and on this quantity the present Committee had to pay an increase in price to the tune of 5s. 4d. per ton. This, again, represents some £800. Now, these obligations, left to us as a sort of *per contra*, come to some £7100; and, as the Council will remember, we gave the consumer a reduction of 1d., which equals some £2300. We have altogether absorbed some £9400 out of the surplus of £10,002 left to us from the accumulated balances of previous years. A word now as to the balance carried to next year in the accounts we are dealing with at present. If you refer to the general balance account, you will find it there stated at £10,491, which, of course, includes the £600 left of the previous Committee's balance. The revenue and fire insurance fund now stands at £22,789, an increase of £1165; while the balance at credit of contingent fund is £90, instead of £1287 last year, there being a considerable increase in the number of annuities purchased during the year. A look at the statistical table will show an increase of 4044 tons of coals used;

while the average price paid per ton is up 1s. 10½d. There has been 37,639,000 cubic feet of gas made more than in the previous year, while the percentage of loss has been reduced by 1·13. Turning, now, to the estimate for the current year, it is a matter of common knowledge that contracts have been entered into for coal and other materials at increased prices, expected to reach at least some £14,000 to £15,000 this year, which, if laid on the consumer, would represent a rise of over 6d. per 1000 cubic feet of gas. In view, however, of the splendid balance on the working of the year just closed, the Committee feel justified in only asking for 2d. of a rise in Aberdeen, as against a rise of 6d. in Dundee and 4d. in Glasgow. But for that balance, there must have been a very large increase in the price. The Committee are, however, hopeful that the present inflation of prices in coal is only temporary; and they prefer to use up the profit of last year rather than keep it in hand and raise the price abnormally high, even for one year. I need hardly say that, but for the increased price of coal, the Committee would have had the pleasure of intimating a reduction of probably 3d. per 1000 cubic feet on the present occasion. Apart from the accounts, there are just two points calling for remark. Slot meters have come to stay; there being 2600 meters already out, and the demand is still increasing. Notwithstanding the enormous increase in the amount of gas sold last year, this year is going to surpass it; the demand last month being 4,600,000 cubic feet greater than that of August last year.

Bailie Henderson said it was very satisfactory that the advance in the price of gas was not more than it had been on account of the price of coal. He supposed the report was agreed to.

Mr. Johnston said he had a word to say in regard to that.

Mr. Watson seconded Mr. Kemp's motion.

Mr. Johnston said he had no amendment to move; but there was a statement made by Bailie Kemp, as Convener of the Gas Committee, which was a little astonishing. The statement was in regard to the old Committee's transactions. Last year they had a balance of £10,000; and, if it had not been the fact that they had this balance, no doubt the price of gas would have been raised considerably this year, because, according to the estimates, they only showed a balance of £970 for next year, while the balance for last year was only £400. Bailie Kemp referred to the coal they had to get last year. But the Committee estimated for coal the year before last on the same principle as the Committee had done last year. They estimated for that coal, at a certain figure, and he supposed the Gas Committee had done the same this year, and they had shown in their estimates that there would be a profit. In the year 1899, the Gas Committee showed a balance of £10,000, which reduced the price of gas to 3s. This balance had been absorbed this year; and the price of gas raised 2d. per 1000 cubic feet, and the estimates only showed a surplus of £970. He thought Bailie Kemp, in all fairness to the Committee of 1899, should say that it was on account of the balance of £10,000 that this year they had only required to raise the price of gas 2d. per 1000 cubic feet.

Mr. Kemp said he had purposely laid himself out to give the previous Committee every credit. Wages were raised by the previous Committee by £800. All these things, to the tune of some £7100, they had wiped out with the balance of £10,000; and with the reduction of 1d., absorbing £2300, they were left with, as he had said, some £600 of the previous Committee's balance.

The motion was then agreed to.

LONGTON CORPORATION GAS SUPPLY.

The Profit on the Gas-Works—Increase in the Manager's Salary.

At the Meeting of the Longton Town Council last Thursday—the Mayor (Alderman Edwards) in the chair—the minutes presented by the Gas Committee included the balance-sheet for the year ending the 30th of June. It showed that the sale of gas to private consumers produced a sum of £18,520, as compared with £15,991 in the preceding twelve months. Adding the public lighting made a total of £21,028, against £18,458. Residuals produced £6378, as compared with £3624. The total revenue was £27,559, against £22,144. The outlay on coal was £8507, against £6614; purifying materials and wages came to £295, against £586; carbonizing wages, to £1668, against £1868; repairs and maintenance of works and plant, to £1562, against £1078. The total expenditure was £17,489, as compared with £15,714; and the balance carried to the net revenue account was £10,070, against £6430. The profit on the year's working, after deducting interest and sinking-fund charges, with the balance brought forward, was £4075, of which £2000 was credited to the borough fund in relief of the rates.

Alderman Bakewell, in moving the adoption of the minutes, said he thought they might all congratulate themselves upon the very handsome results of the year's working. Taking into account the price of coal and the charge for gas, it was far and away the best report the Corporation had ever had from the gas-works—in fact, he could not find any balance-sheet from other works to beat them. This report proved beyond doubt that the plant adopted some years ago only required working upon the right principles to produce very good effects. Alluding to the manufacture of gas, which included the cost of coal, purifying, and wages, he said the increased outlay in this respect last year over the previous twelve months was a little more than £1300; but when they came to take items separately, coal had increased by £1700, while there had been a decrease in wages of £400, and this in face of the fact that a much larger quantity of coal had been handled, and a greater quantity of gas made. He might say, to give an idea of what good management could do, that if the wages last year had been at the same rate per 1000 cubic feet of gas as previously, the bill would have been £1000 more than it was in 1898-9. Therefore, by proper management, £1000 had there been put to profit. The Committee, he remarked, had not at all beggared the concern. They had kept everything in thoroughly good order—in fact, in many respects they had gone out of their way to put on the revenue account expenditure which they might very well have held over till another year. For instance, in regard to the maintenance of the works, the cost last year was upwards of £2300, whereas in the preceding twelve months it was not quite £1500; representing an increase of £850, which had been caused by the refixing—practically the renewal—of the new retorts, which had, through carelessness, been badly managed. Taking other items on the debit side, Alderman Bakewell referred to stoves, and said tha whereas many gas-works only wrote off 10 per cent. on their stoves, a Longton they depreciated them by 20 per cent., which was on the safe side. Turning to the receipts, he said the augmented consumption of gas was very satisfactory. He had occasion to tell the Council some time ago that through the winter months it went up for some time at the rate of 25 per cent.; but the increase for the whole year averaged 20 per cent., which was an extraordinary and very large rate. The residuals had realized a very great increase. Coke had resulted in an advance through the higher price of coal; but other causes brought about the general improvement in the amount realized from residuals. Coke, through proper firing, had been hard and of good quality, in contrast to the soft and friable coke of the previous year, which almost had to be given away. Speaking of the capital account, he said that at Longton it was 17s. 6d. per 1000 cubic feet of gas made; whereas the average of the Staffordshire gas-works in the hands of local authorities was 10s. 6d. There were two ways of reducing the capital account—by allowing it to decrease, and by increasing the production. This year, with the greater production of gas, Longton had been able to bring the capital down by payments which had reduced the amount from 17s. 6d. to 14s. 10d.; and if they could prevent the capital increasing, and pay instalments as they were doing year by year to the sinking fund, they would in a few years have the account in a very satisfactory state. He hoped the Council would encourage the Committee to do this. Alluding to a recommendation to increase the salary of the Engineer and Manager (Mr. W. Langford) by £100 per annum, he said they all knew that, however much a Committee strove, unless they had a good Manager, they could not get satisfactory results for the town. There was no doubt that in Mr. Langford they had an exceedingly good man, who was not only capable, but very industrious and plodding; and he had one of the qualities they had had the character of lacking very much in Longton—courtesy to customers. He (the Chairman) had received on all hands most satisfactory testimonials to Mr. Langford's courtesy. He hoped the Council would accord the increase of salary ungrudgingly, and show their appreciation of the Manager's efforts.

Alderman Leak said he had no objection to the increase, if what had been placed before them was to be traced to more efficient management. But he thought the present satisfactory state of affairs was due in large measure to the increase derived from residuals, which amounted to £2754, and the rise in coke to £887—a total of about £3600 out of the £4011 of total net profit. However, he believed the works were being skilfully managed, and therefore he should vote for the increase. But he thought, seeing they were making the consumer pay more for his gas, they should let him have a little back in the way of reducing the rates, if feasible.

Mr. G. Bloor moved, as an amendment, that the increase be £50 only, but he did not find a seconder; and the Committee's recommendation was carried.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

The Past Year's Working.

The statement of accounts of the gas and water undertakings of the Carlisle Corporation have been adopted by the Gas and Water Committee. The revenue account in connection with the gas-works shows that the total receipts amounted to £44,780, and the total expenditure to £37,689; leaving £7091 to be carried to the profit and loss account. From the private sale of gas there was received £30,111; and from public lighting, £3148—making together £33,259. Meter-rentals yielded £465; and residual products brought in £10,547—coke accounting for £5311, tar for £2698, and sulphate of ammonia for £2537. On the expenditure side, the cost of the manufacture of gas is put down at £32,010, made up of £22,876 for coals, £819 for purifying materials, £381 for salaries of Engineer, &c., £4039 for wages, and £3891 for repairs and maintenance of works and plant. The expenses of distribution came to £2711. In the profit and loss (net revenue) account, the Committee credit themselves with £15,849, consisting of £8758, the balance brought forward from the previous account, and £7091, the balance transferred from the revenue account. The net profit for the year is £4513. The quantity of gas made was 303,781,000 cubic feet; and the quantity sold, 285,041,600 cubic feet, of which 255,806,900 cubic feet were for private consumption. The unaccounted-for gas was 14,502,000 cubic feet. During the year 21,528 tons of common coal and 8764 tons of cannel were carbonized—a total of 30,292 tons. The coke made during the year was 14,096 tons; tar, 2106 tons; sulphate of ammonia, 296 tons. The coke used in the manufacture of gas was 4054 tons.

The revenue account in connection with the water-works shows on the credit side that the net amount of water-rents was £10,234. On the expenditure side, the account shows that maintenance absorbed £3802, and management £496; making the total expenditure £4298, and leaving a balance of £5936 to be carried to the profit and loss account. From this account it appears that the balance, added to that brought from the last account of £8358, with £50 interest, amounts to £14,344. On the other side of the account, it is shown that income tax came to £203; that the amount paid to the district fund was £5983; and that the remaining £8158 is distributed as follows: Amount retained by Water Committee under resolution of Council dated Oct. 25, 1887, £2374; and amount payable to the district fund, £5784, of which £4461 is the net profit for the year.

Last year the amount paid into the city fund on account of the gas profits was £8758, as compared with £6649 payable this year—a decrease of £2109. The net profit for 1898-9 was £6713, against £4513 now. The amount of the water profits paid into the district fund for 1898-9 was £5983, compared with £5783 this year—a decrease of £200. The net profit then was £4764, against £4461—a difference of £303. The quantity of gas made in 1898-9 was £297,742,000 cubic feet, which was about 15,000,000 cubic feet more than the production in 1897-8. The make this year is still higher, by more than 11,000,000 cubic feet. In two years, therefore, the additional quantity of gas made has been upwards of 26,000,000 cubic feet. Private consumption represents an increase this year of about 1,500,000 cubic feet; and upwards of 500,000 cubic feet more gas has been sold for public lighting. The quantity unaccounted for is, however, close upon 1,000,000 cubic feet more.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The half-yearly meeting of the Dover Gas Company was held yesterday week—Mr. Willsher Mannering presiding. It was resolved to declare the usual dividend of 7½ per cent. The increase in the sale of gas was reported to have been 10·8 per cent. as compared with the same period of last year. On the other hand, the expenditure showed an increase of £4946, which was mainly due to the additional cost of coal, higher wages, and the rise in values of nearly all materials used in the manufacture and distribution of gas.

The half-yearly meeting of the Farnworth and Kearsley Gas Company was held on the 30th ult. in the Board-room at the works—Mr. J. W. Watkinson in the chair. The report and statement of accounts showed that the total receipts on revenue account during the six months ending June 30 last amounted to £9484. The expenditure for the same period was £7081; so that there was a balance of £2403 to carry to profit and loss account, bringing it up to £5070, which sum was available for distribution. The Directors recommended the usual dividends for the half year—viz., at the rate of 10 per cent. on the "A" stock, and of 7 per cent. on the "B" and "D" stocks, less income-tax. The report was adopted. The quantity of gas sold during the six months aggregated 57,116,000 cubic feet, against 48,371,000 cubic feet in the preceding half year. The Company have 1260 penny-in-the-slot meters in use.

The half-yearly meeting of the Kingston Gas Company was held on the 30th ult.—Alderman Bedford Marsh in the chair. The Directors' report showed that the receipts for the six months ending the 30th of June last amounted to £40,297. The amount paid for rates and taxes (for the half year) was stated to be £1466. Reference was made by the Chairman to the new works in progress, which he stated were essential to an adequate supply of gas. The payment of the customary dividends was sanctioned. The thanks of the shareholders were given to the Board of Directors, the Manager, the Secretary, and the staff; and the Chairman, Mr. H. F. Packham, and Mr. J. A. Fricker suitably responded. An extraordinary meeting was then held, when it was resolved that the Directors be empowered to raise further capital under the new Act.

The report presented by the Directors of the Lewes Gas Company at the half-yearly meeting of shareholders last Wednesday was accompanied by accounts which showed that in the six months ending June 30 there was a profit of £1739. After providing for interest on mortgages, the balance of net revenue (as shown in the profit and loss account) was £3098. The Directors recommended that a dividend for the past half year should be declared at the rate of 5 per cent. upon the consolidated original capital stock, and at the rate of 3½ per cent. upon the additional capital stock. These dividends (after deduction of income tax) would amount to £1422, and leave a balance of £1676 to be carried forward. The Chairman (Alderman Kemp), in moving the adoption of the report, said there had been an increase in the quantity of gas sold to the extent of 10 per cent., which was very considerable; and they had 450 penny-in-the-slot consumers. This was a comparatively new part of their business; and he was glad to know that it was a substantial part. He trusted it would increase. With regard to the coming half year, the advanced price of coal, of course, affected them very considerably. The Directors were very reluctant to raise the price of gas; but they did not think they could do other than follow the example of most gas companies in taking this course, because they were absolutely dependent for their dividend upon the price of gas and coal. If the latter advanced, the former must necessarily follow sooner or later. Of course, if the price of coal were lowered, that of gas would follow all over the country; and the Directors would be only too glad when this time arrived. The motion was carried; and the dividends recommended were declared.

At the annual general meeting of the Morecambe Gas Company, recently held, the report of the Directors noticed in the "JOURNAL" for the 28th ult., in which a dividend of 15¼ per cent. was recommended, was adopted. The Chairman (Mr. W. C. Welch) expressed regret that they were parting with their undertaking, which had a good future before it, though they were not dissatisfied with the amount they had received for it. He spoke very highly of the way Mr. W. Duff, the Engineer, and his son, who assisted him, had discharged their duties.

The shareholders of the Richmond Gas Company held their half-yearly general meeting on the 30th ult.—Mr. T. J. Carless in the chair. In moving the adoption of the Directors' report, the Chairman stated that during the six months ending June 30 the total amount expended which was chargeable to capital had been about £460, for new mains, services, &c. The continued increase in the demand for gas had, however, now overlapped the producing capacity, and had necessitated the extension of the carbonizing plant. They had accordingly started on the erection of new retorts to fill up the existing space in the retort-house, the capital charges for which would fall upon the next half year. There was a considerable increase in the cost of coals to be noted—viz., £2470. The whole of this sum, however, was not attributable to the rise in price; 1000 tons more having been used to meet the growing demand for gas. But the remainder of the old contracts would have all expired in the current half year; and they would have to meet the most serious rise in price that had taken place since the coal famine of the early seventies. This had necessitated an increase in the price of gas, which a careful husbanding of resources in the past had enabled the Board to limit to 4d. per 1000 cubic feet. The increase in the sale of gas amounted to 7½ per cent.; and as during the corresponding period of 1899 he had to record an increase of 4½ per cent., they were evidently going ahead in a very satisfactory way, despite the competition of other illuminants. Cooking-stoves were largely in demand; and the prepayment meter system had become a profitable part of the business. The total extra sum received for gas, public lighting, meter and stove rents, &c., amounted to £1375, which unmistakably marked the growth of the Company's business. Residual products had also brought in increasing amounts; coke particularly showing the result of the general rise in the price of all fuels. It was well that it was so, or the Company would not have been able to restrict the advance in the price of gas to the modest figure already mentioned. The profit and loss account showed a balance of £8041, which would allow of the usual dividends, and a carry forward of £4061. Mr. Aldin seconded the motion, and it was carried. The dividends as recommended in the report were then declared—viz., 5 per cent. on the "A" and "B" stocks, and 3½ per cent. on the "C" stock, for the half year. Mr. Aldin proposed a vote of thanks to the Directors for their services during the past half year. This was seconded by Mr. Grunhold, and carried. The Chairman briefly acknowledged the compliment, and moved that the best thanks of the meeting be given to the Engineer (Mr. T. May) and other officials.

The shareholders of the Sevenoaks Gas Company held their half-yearly general meeting on the 30th ult.—Mr. W. Hughes presiding. The Directors reported that the accounts were satisfactory, looking to the disturbed state of the coal market and other matters. The gross receipts had been £7689, and the expenditure £5620, leaving a profit of £2069. After providing for interest on debenture stock and other charges, there remained £4837 available for distribution; and the Directors recommended a dividend at the rate of 10 per cent. on the original capital, and of 7 per cent. on the additional capital (less income-tax). The Directors regretted that, through the increase in the price of coal, they had been compelled to raise the price of gas 6d. per 1000 cubic feet. Two additional beds of retorts had been connected up, and two other beds were in course of construction. The Chairman moved the adoption of the report. He said the quantity of gas made had increased about 10½ per cent., and the residuals were better. Mr. T. Hill seconded the motion, which was agreed to; and the dividends recommended were ordered to be paid.

The annual meeting of the Sunderland Gas Company took place last Wednesday—Mr. James Stokoe in the chair. In moving the adoption of the report, which was noticed last week, he said they had made 4·76 per cent. more gas during the past year than in the preceding twelve months. The total increase in the revenue was £13,140, against £16,000 additional expenditure; leaving a deficiency of about £3000 on the year's working, which had been taken out of the reserve fund. Mr. G. R. Booth seconded the motion; and it was carried. A dividend of 5 per cent. on the original stock, and of 4½ per cent. on the additional capital stock (less income-tax) was declared.

At the recent half-yearly general meeting of the Sutton (Surrey) Gas Company, the Directors reported that the balance available for distribution was £8284; and they recommended the declaration of dividends at the rates of 10 and 7 per cent. per annum respectively, on the original and additional capital, both less income-tax. The Chairman (Mr. F. Bugden), in moving the adoption of the report, said the shareholders might consider they had had a fairly prosperous half year. Even though there had been a rise in the price of coal—and it showed an increase of nearly £1500—their business had fortunately increased in proportion, and their profits had not suffered materially through the advance. On the contrary, their finances had augmented very considerably. The gas-rental was higher by £1031, or nearly 14 per cent.; the meter-rentals by £122, or 36 per cent.; and the returns from residuals had increased by the large sum of £1163, or 32 per cent. During the half year, there had been 42 new consumers, making the number 1560; and the slot-meter consumers had increased by 50, making the total 380. Mr. T. Charles seconded the motion; and it was carried unanimously. The dividends recommended having been declared, Captain Strong moved—"That, in consideration of the long and valued services of Mr. Stephen Carpenter, the Works Manager of the Company, a sum, not exceeding thirty guineas, be expended in the purchase of a gold watch and chain, with suitable inscription, to mark the occasion." The proposition was unanimously agreed to. Dr. Strong then moved a comprehensive vote of thanks to the Chairman, Directors, Secretary, and employees of the Company, for their valuable services during the past year, and it was carried, and briefly acknowledged by the Chairman.

The annual general meeting of the City of Waterford Gas Company was held on the 29th ult.—Mr. W. H. H. Shaw presiding, in the absence of the Chairman (Mr. R. Hesketh Jones). The Directors reported a profit of £2456; being £878, or 1½ per cent. on the consolidated stock, less than in the preceding year. This was due to an increase of £2445 in the cost of gas production; £1980 of it being for coals, and £107 for stokers' wages. There was, however, an increase of £1567 in the revenue to counterbalance the additional cost. Under these circumstances, they recommended the payment of a dividend of 1½ per cent., making with the interim dividend 4 per cent. for the year, as compared with 5½ per cent. in 1898-9. They gave notice of an increase of 3d. per 1000 cubic feet in the selling price of gas, as from the 25th of March last; and they expressed regret that, in order to ensure a supply of coals for the ensuing year to carry out their statutory obligations, they had been compelled to pay an increased price of from 8s. 6d. to 9s. per ton. During the past year coals cost 18s. 9d. per ton in Waterford. The coals to be received for the twelve months from the 30th of June last would cost not less than 25s. 6d. per ton. It would be necessary to further increase the selling price of gas by 3d. per 1000 cubic feet from the 25th of September next. This increased price would not yield sufficient to meet the increased cost of coal. The Directors, however, hoped that under the new Resident Manager (Mr. J. G. Tooms), who had just entered on his duties, the revenue account next year would show better results. The Directors went on to say that for the past two or three years the health of Mr. George Donaldson, the Resident Manager, had been failing, and they had reluctantly found it necessary to appoint a new one. They had agreed to grant Mr. Donaldson a pension during the pleasure of the Board. For the current year, this would be no burden on the profits, as Mr. Anderson had voluntarily offered to reduce his remuneration as Chief Engineer and General Manager by £100, and the Directors their fees by a like sum. The Chairman, in moving the adoption of the report, prefaced his remarks by apologizing for the absence of Mr. Jones, which, he regretted to say, was due to a carriage accident. Having dwelt at some length upon the affairs of the Company in the past year, he alluded to the change in the management, and spoke in sympathetic terms of the retirement of Mr. Donaldson, who had proved himself to be a valuable and faithful servant for seventeen years. Their new Manager had shown himself to be very efficient in other places; and he (the Chairman) hoped he would take the same trouble in the management of the works that Mr. Donaldson had always done. Mr. Lynch seconded the motion; and it was carried unanimously.

The Wellingborough Gas Company, Limited, had their half-yearly general meeting on the 27th ult., on which occasion the accounts presented, covering the six months to the 30th of June, showed receipts to the amount of £9144, and expenditure totalling to £6635; leaving £2509 to go to the profit and loss account. The sum available for distribution was £4427; and the Directors recommended dividends of 6 per cent. on

the "A" and "B" shares, and 4½ per cent. on the "C" shares (income-tax paid). The Directors alluded in their report to the fact that many gas companies had been compelled, by the exceptionally high price of coal, to advance their charge for gas; but they added an expression of their gratification at being able to postpone doing so for the present. Every effort is being made to popularize the use of gas both for lighting and cooking; and a great number of cookers have been fixed for use with prepayment meters. The quantity of gas sold by meter in the half year was 44,918,100 cubic feet; the consumption for public lighting (1,942,400 cubic feet) bringing up the total to 46,860,500 cubic feet. The sale of gas was 8½ per cent. more than in the first half of 1899. The works (under the supervision of Mr. J. T. Lewis) have been improved by the telescoping of the 110-feet holder; and the other alterations and extensions are progressing rapidly, so as to be in readiness for the coming winter season. The working statement forming a portion of the accounts shows that 4512 tons of coal were carbonized; the residual products entered being 50,014 gallons of tar, and 51,000 gallons of ammoniacal liquor—sulphate of ammonia to the extent of 26½ tons being made.

In the six months ending June 30, the Windsor Royal Gas Company had a revenue of £7145 from the sale of gas (41,962,600 cubic feet to private consumers, and 346,500 cubic feet for the public lamps), and of £1844 from coke and breeze; the total receipts being £9869. The expenditure was £7736; so that the balance carried to the profit and loss account is £2133. At the meeting of the Company next Friday, the Directors will recommend that dividends be paid at the rate of 5 per cent. per annum on the preference shares, 7 per cent. per annum on the new shares, and 10 per cent. per annum on the original shares. The quantity of coal carbonized or used was 4835 tons; 3995 chaldrons of coke were sold, 404 loads of breeze, 51,693 gallons of tar, and 44 tanks of ammoniacal liquor.

Water Companies.

The operations of the Crowborough District Water Company have not, so far, been successful; having resulted in a net loss of £454. There are, however, various outstanding claims due to the Company awaiting adjustment. In the report presented at the half-yearly meeting on the 31st ult., the Directors stated that the number of consumers, exclusive of building supplies, was, on the 30th of June, 162. The supply of the Company's water had been admirably maintained throughout the whole of the district. They believed that public confidence was growing daily, and that a steady accession of customers might therefore be expected. At the same time, they pointed out that the maintenance of a supply of filtered water in a large district many hundred feet above the sea-level, so as to give satisfaction to consumers and attract a large amount of custom, involved continuous outlay; and the shareholders must consequently have patience at first, with the view to the more certain assurance of good returns from a thoroughly well-established undertaking. It was impossible for a forecast of any value to be made as to the dividends on the ordinary capital; but with the co-operation of consumers and shareholders, the Board anticipated results alike advantageous to the important and growing neighbourhood supplied, and to the proprietors who had invested their capital in the concern.

The Sevenoaks Water Company had a balance of £1350 available for distribution at the close of the past half year; and at the recent meeting the Directors recommended a dividend at the rate of 9 per cent. per annum on the consolidated stock, and £6 6s. per cent. per annum on the share capital, free of income-tax. This would absorb £1214, and leave a balance of £135 to be carried forward. In the course of his remarks when moving the adoption of the report, the Chairman (Mr. D. Reid) referred to the opposition offered to the Company's application to the Board of Trade for power to raise additional capital, to which he alluded when addressing the shareholders in February last. He was pleased to say it was withdrawn, and the Royal Assent to the Order was given on the 30th of July. The new Order not only gave the Company power to raise the additional capital which they might find necessary to carry out efficiently the extensions the growth of the town and district called for, but also gave the Urban District Council authority to negotiate and conclude a purchase of the whole of the Company's undertaking at any time within three years from the date of the Order, on their giving six months' previous notice. The report was adopted, and the dividend recommended was assented to.

NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held on Monday last week, at Winchester House, Old Broad Street, E.C., to confirm the resolution for winding up the Company which was passed at the meeting held on the 10th ult., and for the appointment of a Liquidator. Mr. J. H. Duncan, the Chairman of the Company, presided.

The Secretary (Mr. Lawrence Fletcher) having read the notice convening the meeting,

The Chairman said the work they had to do that day was very formal. It only remained now for them to go definitely into liquidation; and the moment they passed the confirmatory resolution this would be done. Shareholders would naturally ask how things stood in regard to the carrying out of the contract. The position of affairs was that all points on the trust deed had been agreed to, with the exception of one single matter. The point at issue was one which the Board felt they could not themselves give up, and therefore they brought it before the shareholders. Trustees had to be appointed for carrying out the purposes of the debenture stock; and these trustees the Board held ought to be entirely in the interest of the Company. They therefore asked that the trust deed should provide some remuneration for them, in the event of their having to act, as otherwise they might find it difficult to secure trustees. The Welsbach Company had replied that they would find trustees who would act without remuneration; and these trustees, of course, would be members of their own Board. He thought, taking all things into consideration, that it would be better for them to have trustees independent of the Welsbach Company. This question was now hanging between them; but he had reason to think

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 639.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	**GAS COMPANIES.**			£ s. d.	£			p. c.	**GAS COMPANIES.**			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p. c.	18¼–19½	..	5 7 8	60,000	5	Feb. 28	7	Ottoman, Ltd. . . .	5–5½	..	6 7 3
100,000	10	,,	7½	Do. 7 p. c.	13½–14½	..	5 3 5	500,000	100	June 1	6	People's Gas 2nd Mtg. of Chicago Bonds	102–106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb. .	101–103	..	4 17 1								
200,000	5	May 16	6	Bombay, Ltd. . . .	6–6½	..	4 12 4	851,070	10	Apl. 27	7	River Plate Ord. . . .	10½–11	+½	6 7 3
40,000	5	,,	6	Do. New, £4 paid .	4–4½	..	5 6 8	250,000	Stk.	June 28	4	Do. 4 p. c. Deb. .	99–101	..	3 19 8
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245–255	..	4 14 1	250,000	10	Apl. 11	8	San Paulo, Ltd. . . .	11½–12½	..	6 8 0
270,000	,,	,,	9	Do. New . . .	177–182	..	4 18 11	135,000	Stk.	Mar. 14	10	Sheffield A.	245–247	..	4 1 0
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140–145	..	3 9 0	209,700	,,	,,	10	Do. B.	244–246	..	4 1 4
159,375	,,	June 14	4	Do. 4 p. c. Deb. .	116–120	..	3 6 8	447,427	,,	,,	10	Do. C.	244–246	..	4 1 4
220,000	Stk.	Mar. 14	10†	Brighton & Hove Orig. .	225–235	..	4 5 1	5,641,885	Stk.	Aug. 15	5½	South Metrop., 4 p.c. Ord.	127–129	..	4 2 7
226,820	,,	,,	7†	Do. A. Ord. Stk. .	155–165	..	4 4 10	1,520,000	,,	July 12	3	Do. 3 p. c. Deb. . .	94–97	..	3 1 10
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p. c. max. .	117–118*	..	4 4 9	380,940	Stk.	May 16	5	Southampton Ord. . .	115–120	..	4 3 4
420,000	20	Mar. 29	10	British	39–41	..	4 17 7	70,825	,,	July 12	4	Do. 4 p.c. Deb.	117–122	..	3 5 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c. .	24–26	..	4 12 4	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c.	110–115*	+8	5 4 4
79,000	10	,,	9	Do. 7 p. c. . . .	19–21	..	4 5 8	250,520	,,	,,	4½	and B. 3½ p.c.	80–85*	..	5 5 11
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	8⅞–9¼	..	6 9 9	61,550	,,	June 14	4	Edmonton 4 p. c. Deb.	111–115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p. c. Deb. .	98–100	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7–8	..	6 5 0
150,000	20	July 12	8½	Cagliari, Ltd. . . .	23–25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98–102	..	4 18 0
100,000	10	June 14	8	Cape Town & Dis., Ltd.	13–14	..	5 14 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55–57	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock .	270–280	..	4 16 5								
236,425	,,	,,	10½	Do. New do. .	205–215	..	4 17 8								
288,237	,,	June 14	4½	Do. 4½ p. c. Deb. .	133–138	..	3 5 3								
800,000	Stk.	May 31	9	Continental Union, Ltd.	160–165	+2	5 9 1					**WATER COMPANIES.**			
200,000	,,	,,	7	Do. 7 p. c. Pref. .	170–175	..	4 0 0	780,404	Stk.	June 28	11	Chelsea, Ord.	298–303	+3	3 12 7
51,600	Stk.	Feb. 23	14	Croydon A 10 p. c. . .	335–340	..	4 2 4	150,000	,,	,,	5	Do. 5 p. c. Pref. .	155–160	..	3 2 6
178,400	,,	,,	11	Do. B 7 p. c. . .	265–270	..	4 1 5	160,000	,,	,,	4½	Do. 4½ p. c. Pref. 75	143–148	..	3 0 10
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	110–115	+3	4 11 4	175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb. .	145–150	..	3 0 0
60,000	,,	,,	5	Do. 5 p. c. Pref. .	130–135	..	3 14 1	1,720,560	Stk.	Apl. 11	7	East London, Ord. . .	192–197	+2	3 11 1
486,090	10	July 27	11	European, Ltd. . . .	19–20	..	5 10 0	654,740	,,	June 14	4½	Do. 4½ p. c. Deb. .	147–152	..	2 19 3
354,060	10	,,	11	Do. £7 10s. paid .	14–15	..	5 10 0	390,000	,,	,,	3	Do. 3 p. c. Deb. .	96–98	..	3 1 3
14,993,075	Stk.	Aug. 15	4 4/10	Gas-light and Coke	97–99	..	4 8 10	700,000	50	June 14	7½	Grand Junction 10 p. c. max.	107–110	..	3 8 2
2,800,000	,,	,,	8½	8½ p. c. max.	92–94	..	3 14 6	310,000	Stk.	Mar. 29	4	4 p. c. Deb. .	130–135	..	2 19 3
8,799,735	,,	,,	4	4 p. c. Con. Pref.	114–117	..	3 8 5	708,000	Stk.	Aug. 30	14	Kent	290–300*	..	4 13 4
9,993,975	,,	June 14	3	3 p. c. Con. Deb.	93–95	..	3 8 2	160,000	,,	,,	7	Do. New, 7 p. c. max. .	200–210*	..	3 6 8
70,000	10	May 31	8	Hongkong & China, Ltd.	13½–14½	..	5 10 4	1,043,800	100	June 28	10½	Lambeth, 10 p. c. max. .	282–287	..	3 13 2
3,800,000	Stk.	May 16	10	Imperial Continental .	202–207	+2	4 16 7	406,200	100	,,	8	Do. 7½ p. c. max. .	205–210	..	3 16 2
473,600	Stk.	Aug. 15	3½	Do. 3½ p. c. Deb. Red.	99–101	..	3 9 4	850,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb. .	128–132	..	3 0 7
75,000	5	June 14	6	Malta & Medn., Ltd. .	4½–5	..	6 0 0	500,000	100	Aug. 15	14	New River, New Shares	410–415	..	3 7 6
560,000	100	Apl. 2	5	Met. of 5 p. c. Deb.	107–110	..	4 10 11	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128–133	..	3 0 2
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	106–108	..	4 3 4	902,300	Stk.	June 14	7½	South-wark Ord. . . .	193–198	..	3 15 9
841,920	20	May 31	3½	Monte Video, Ltd. . .	10½–11½	..	6 1 8	126,500	100	,,	7½	,, 7½ p. c. max.,	182–187	..	4 0 3
667,946	Stk.	Aug. 30	9¼	New'tle & Gatesh'd Con.	210–215*	..	4 6 1	489,200	Stk.	,,	5	and 5 p. c. Pref.	155–160	..	3 2 6
299,855	Stk.	June 28	8½	Do. 8½ p. c. Deb. .	104–107	..	3 5 5	1,019,585	,,	Apl. 11	4	Vauxhall 4 p. c. A Deb.	129–134	..	2 19 9
150,000	5	May 16	8	Oriental, Ltd. . . .	7¼–7⅞	..	5 3 8	1,155,066	Stk.	June 14	10	West Middlesex . . .	272–277	..	3 12 3
135,000	5	,,	8	Do. New, £4 10s. pd.	5–6¼	..	5 10 10	200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	140–145	..	3 2 1
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼–1⅝	..	4 11 6	200,000	,,	Mar. 14	8	Do. 8 p. c. Deb. .	98–100	..	3 0 0
					* Ex. div.								*Ex div.		

† Next dividend will be at this rate.

that it would be satisfactorily settled. The matter could, however, be closed at any moment by their simply accepting the Welsbach Company's offer to provide trustees. Of course, the eventualities in which these trustees would have to act were rather far off. They would have to act in the event of default in the payment of the interest, or in the case of a reconstruction. It seemed to the Directors that, in either of these events, it would be well to have trustees who were quite independent of the Board of the Welsbach Company; but, at the same time, they were not prepared to say that there would be any particular danger in being represented by two of the Directors of that Company. One other matter he had to mention was the accident which happened at their offices on the 11th ult. On that date a fire broke out which damaged the greater part of their stock, as well as the furniture and fittings; and this, of course, to a large extent altered the complexion of the settlement with the Welsbach Company. Fortunately, they were pretty well covered by insurance; and he thought he might say that they would be able to get back—of course, for the Welsbach Company—practically the whole of the loss. Another difficulty in connection with the fire was that their books were for several days in the hands of the salvage corps; and, as a matter of fact, they only succeeded in getting a preliminary certificate from the Auditors (Messrs. Monkhouse, Stoneham, and Co.) on the previous Saturday. The Auditors had asked a fee of 100 guineas for a full audit of the accounts; and the Directors preferred to consult the shareholders before incurring this expense. They had already paid 25 guineas for the preliminary certificate; and it was for the shareholders to decide whether it was worth while spending another 75 guineas on the fuller audit to which he had referred. He concluded by moving that the Company be wound up voluntarily under the Companies Acts.

Mr. W. Conolly seconded the motion; and it was carried

It was next agreed that Mr. Frederick Belcher be appointed Liquidator for the purpose of winding up the Company.

The Chairman then referred to the proposed public issue of the stock to be received from the Welsbach Company. He said the shareholders were pretty unanimous in deciding that a public issue should be made; but there was a difference of opinion as to the terms. It would be inadvisable to discuss the conditions in an open meeting; and therefore he suggested that a Committee should be appointed to go into the matter. He proposed that the Liquidator be authorized to make a public issue of the stock.

This was agreed to; and a Committee consisting of the Chairman and four shareholders was appointed to confer with the Liquidator.

It was next resolved, on the motion of Mr. Holmes, seconded by Mr. Wethered, "that it be conveyed to the Welsbach Company as an expression of the wishes of this meeting that two of the Directors of this Company be appointed trustees for the debenture stock holders, at a remuneration of £25 per annum each payable, by the Welsbach Company, only in the event of the principal amount of the stock be coming due."

It having been agreed that the Auditors should be requested to supply a full audit of the accounts at an additional fee of 75 guineas,

The proceedings terminated with a vote of thanks to the Chairman.

ELECTRIC LIGHTING NOTES.

The Yeadon District Council have decided to ask the Board of Trade to extend the time specified in their Provisional Order for electric lighting, on the ground that the depressed state of trade and the undeveloped condition of the town make it inadvisable to put down electric lighting plant at present.

The experiment of giving the artisan class an opportunity of using the electric light is to be tried in Portsmouth; and plans have been prepared for running the cables through a thoroughfare which is considered to be eminently adapted for the experiment. Alderman Ellis, the Chairman of the Electric Lighting Committee, who, in conjunction with a resident at Southsea, has invented a penny-in-the-slot meter, is sanguine as to the success of the experiment; and he would like to see the cables carried through every street in the borough. The slot instrument at present in use gives a six-hour 8-candle light for 1d.

Volumes of smoke issued from the entrance to the Bank Station of the City and South London Electric Railway, situated under the church of St. Mary Woolnoth, at the corner of Lombard and King William Streets, early last Thursday morning. The firemen from the nearest stations were summoned, and they broke open the iron gates and groped their way down the stairs and passages to a depth of 80 feet. In a chamber underneath the lift well several electric wires had fused and set light to the wooden beam to which they were attached. The outbreak was not subdued without considerable difficulty and danger.

Some months ago the Electric Lighting Committee of the Bath Corporation resolved upon a general reduction in the price of current to 4½d. per unit for ordinary consumers (public and private), to take effect in June. But in consequence of the great rise in the price of coal, the reduction was suspended. It was promised, however, that the Commit ee would as speedily as possible bring it about; adding whatever was necessary to ensure themselves against loss by reason of the enhanced price of coal. The Engineer, at a recent meeting of the Committee, reported that he had gone into the additional cost on account of the high price of coal, and he found, taking it all round, public and private, that the additional cost of production would be ½d. per unit. The Committee accordingly resolved that all consumers should be charged this sum above the figures fixed previous to the rise in the price of coal. Ordinary consumers, therefore, will pay, for the present, 5d. per unit; and consumers who have hitherto paid at the rate of 4d. will have to pay 4½d.

The subject of the increase to be made in the price charged for electric current came before the Worcester City Council at their monthly meeting last Tuesday. The Mayor (Alderman Millington) proposed that the Council direct that from the 29th inst. the charges for electric current shall be as follows: To private consumers, 6½d. and 3d. per unit; for the water-works motors 1¾d. per unit; for the public arc lamps an additional £2 2s. per year for an all-night lamp, and an additional £1 1s. for a half-night lamp; and for the public incandescent lamps an additional 5s. per annum. He explained that the alteration was due to the great advance in the price of fuel, which, as far as they could see, would still go on.

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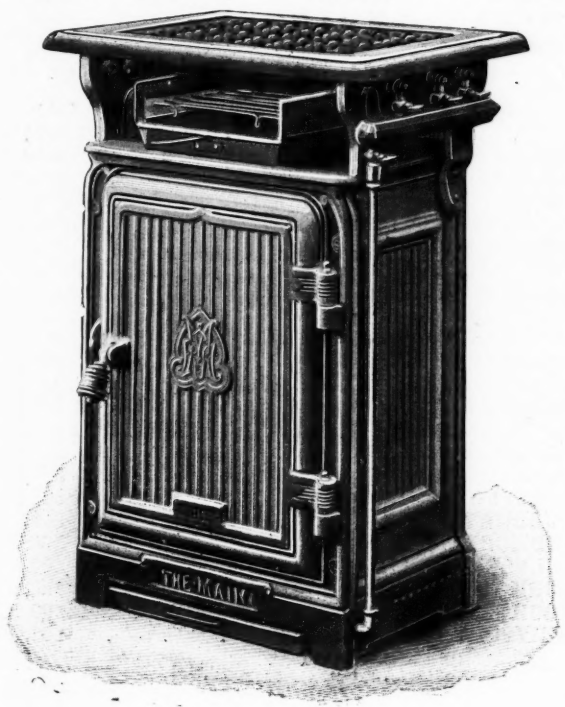

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Full Particulars and Special Quotations on Application.

He was only surprised that the Committee had not brought the proposition up before, because in their estimates for 1900 they included an extra sum of £1000 for coal. They had now taken the proper course; and if the Council agreed to the figures, he thought no one could possibly grumble. He pointed out that nearly all the gas companies had had to raise their prices. Alderman Higgs objected to the increase, on the ground that it was too large. To the first class of private consumers it was at the rate of 10 per cent., and to the second 15 or 20 per cent. He thought 5 or 6 per cent. would have been sufficient. Alderman Ernest Day remarked that the price of gas had not gone up very much, because the returns from residuals had gone up also, whereas in the production of electricity there were no residuals to dispose of. He regretted that the advance should come just now; but he hoped that it would soon be reduced. Mr. Fairbairn inquired how much the increase would add to the cost of public lighting. The Mayor replied about £100 a year. In answer to Alderman Higgs, the Mayor said the increase was only at the rate of 8 per cent., which was nothing compared to the increase of 45 and 50 per cent. in the cost of coal. The resolution was carried.

The Hours of Labour at the Hartlepool Gas-Works.—The stokers employed by the Hartlepool Gas and Water Company have decided to apply for a reduction of their working hours to eight per day; and Mr. H. Lynes, the District Secretary of the Gas Workers' Union, has been instructed to make the application.

Gas v. Electricity for Infirmary Lighting.—At the annual Court of Governors of Salisbury Infirmary on the 30th ult., the Committee of Management, in the course of their report, said: "The proposal to instal the electric light in the Infirmary has been fully considered. Three lights have been introduced into the Casual Department; but, after very careful inquiry, the Special Committee appointed for the purpose reported that they could not recommend the introduction of the electric light generally—it appearing, from the best information obtainable, that the cost of it is greatly in excess of that of gas. The Committee recommended that incandescent burners should be adopted throughout the building. This has been carried out by the Gas Company, who have undertaken to maintain each lamp at a fixed rate per annum."

The Price of Gas in Newcastle-upon-Tyne.—At the meeting of the Newcastle-upon-Tyne City Council last Wednesday, a letter was read from the Secretary of the Newcastle Gas Company (Mr. T. Waddom), referring to a previous letter intimating a proposed advance of 4d. per 1000 cubic feet in the price of gas. He said he had now the pleasure to inform them that the Directors had decided to only raise the price by 3d., to take effect from the June reading of the meters. The causes which had operated to enable the Directors to take this step were the enhanced value of residuals—particularly coke and tar—and a considerable increase in the sale of gas during the first half of the present year, as compared with the corresponding period of 1899. He pointed out, however, that these favourable conditions might not continue during the remainder of the period covered by the existing coal contracts, and in that case it might be necessary to raise the price at a future date.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week has seen the last public references to the business of the past financial year, in the adoption of the gas accounts at Glasgow, Aberdeen, and St. Andrews; and the gas industry is now launched everywhere upon the business of the current year.

In Glasgow, the ruling principle in conducting the Corporation gas and other departments seems to be that the less the public know of the business the better. There is a good deal of sense in this view, because it is the results with which the public really have to do. At the same time, it has to be remembered that it is the business of the public which the Corporation manage, and that the public have an interest in knowing how the concerns are carried on. No one will say that Mr. Mitchell's remarks to the Town Council this week (which are given in another column) make anyone much the wiser as to what the Gas Committee are doing. He made no mention of revenue or expenditure, of capital outlay, of annuities, of borrowed money and the repayment of it, of the operation of the sinking fund, of the output of gas, of the competition with electricity, of the use of gas-stoves, or of the adoption of the incandescent system of gas lighting. All these have a bearing upon the finances of a gas undertaking; and they are all subjects which are dwelt upon, more or less, by the gentlemen who present the accounts of gas undertakings that are not a twentieth part the size of the mammoth one in Glasgow. The community of Glasgow have elected their Gas Committee; and they must take the doings of the Committee on trust. It must be admitted that there is good reason for asking them to do so—or perhaps it would be a more felicitous expression to say that the community have good reason to be content with the arrangement, for the business has been most admirably conducted all along. And, after all, it is simply a question of convenience how much the public are entitled to know. A population of nearly a million cannot all be admitted to the works, or look over the shoulder of the book-keeper so as to see what his entries are, even although it were politic to admit them, or any of their number, to do so. That is a work which must be done by proxy; and the proxies who do it are the members of the Gas Committee. If the Committee are satisfied that all is well, the community are in the happy position which is popularly described by the expression "where ignorance is bliss." But with all this, it is difficult to reconcile the fact of this being the business of the public with the practice of not letting the public know anything about it. It is true that the subject of publicity is not confined to Glasgow; only in Glasgow there is less known about public business than in most places. Perhaps the amount of business is so large that it would be next to impossible to give anything like a full account of the transactions which are made on behalf of the public. But this, of course, can be no answer to the abstract question of how far the public are entitled to know of affairs relating to what, in the ultimate, is their property. I do not forget that the Glasgow Corporation are most amiable in their treatment of the newspaper press; but, although I have strong newspaper proclivities, I cannot accept publication of such information.

CARBURETTED WATER-GAS APPARATUS

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	WINNIPEG, MAN.	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
COLCHESTER	300,000	YORK	750,000
BIRKENHEAD	2,250,000	ROCHESTER	500,000
SWINDON (New Swindon Gas Co.)	120,000	KINGSTON, ONT.,	300,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	CRYSTAL PALACE DISTRICT	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	DULUTH, MINN.	300,000
HALIFAX	1,000,000	CATERHAM	150,000
TORONTO	250,000	LEICESTER	2,000,000
OTTAWA	250,000	ENSCHEDE (HOLLAND)	150,000
LINDSAY (Remodelled)	125,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
MONTREAL	500,000	BURNLEY	1,500,000
TORONTO (Second Contract; Remodelled)	2,000,000	KINGSTON-ON-THAMES	1,750,000
BELLEVILLE	250,000	ACCRINGTON	500,000
OTTAWA (Second Contract)	250,000	TONBRIDGE	300,000
BRANTFORD (Remodelled)	200,000	STRETFORD	500,000
ST. CATHERINES (Remodelled)	250,000	OLDBURY	300,000
KINGSTON, PA.	125,000	TODMORDEN	500,000
PETERBOROUGH, ONT.	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
WILKESBARRE, PA.	750,000	YORK (Second Contract)	750,000
ST. CATHERINES (Second Contract)	250,000	ROCHESTER (Second Contract)	500,000
		NEWPORT (MON.)	250,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

as a newspaper may care to give as being official or authoritative. It is undoubtedly the most efficient method of conveying information to the people to hand it to a newspaper; and newspaper proprietors are always grateful to those who entrust them with such information. But they do not take upon themselves the task of giving it out as from the furnisher; it is as from the editor, who becomes responsible for it. The whole subject of the extent of publicity is in a mixed condition. There are statutory provisions dealing with it, as in the Burghs Gas Supply Act; but notwithstanding these, nearly every body is, in this matter, a law unto itself. This, I suppose, is one of the glorious privileges of being independent, spoken of by Burns. Probably it is the best indication that the want of system works no harm, that the subject is seldom alluded to.

Having said this about the meagreness of detail in Mr. Mitchell's statement, I go on to note my sympathy with his policy. When the poor quality of the remarks which were made by the other speakers is considered, it must be admitted that there is good reason for not saying much. A profusion of detail might open the flood-gates of unintelligent criticism. Surely in an enlightened Corporation, such as Glasgow, something better might have been expected than the platitudes which were spoken about the reduction of leakage, the importation of American coal, and the acquisition of a coal mine. Knowing the speakers, I am not surprised at the quality of their remarks. To talk at large is an accomplishment which is easily acquired; but such frothy utterances do little good. It was so here; and the feeling arises that this year at least the gas accounts of the Corporation of Glasgow have not received a dignified treatment at the hands of the Council, either in presentation or in criticism.

The acquisition of a coal mine by a municipality is a fascinating subject to dangle before the electors; but it is not within the legitimate purposes for which municipalities are created. It is carrying municipal trading beyond the bounds of communal duty, which is all that a municipality can undertake; and the Gas Committee of Glasgow have arrived at a right conclusion in deciding not to proceed with the proposal.

An attempt was made again to raise the question of making the advance of the price of gas retrospective. The interrogator wanted to know what statutory authority there is for doing this. He was told, in reply, that his question was answered at the previous meeting; but he protested that it was not. Well, it was answered; but not in the way he wanted. There is, of course, no statutory authority for making changes in the price of gas retrospective. But there is no statutory provision against it; and the convenience is so great that it justifies the procedure.

The Aberdeen Corporation gas accounts were presented with more fulness, by Mr. Kemp, the Convener of the Gas and Electricity Committee. Without giving away Corporation secrets, he made a readable statement in explanation of the position of the undertaking. This is quite satisfactory, notwithstanding the circumstance that the Committee have adopted estimates which are based on a deficit being experienced, and its being met by accumulated balances from past years. Very probably their policy will be adversely criticized when the accounts come up next year, because the opportunity of having a dig at somebody is always appreciated by notoriety hunters, and a loss upon the gas undertaking is, at any time, a subject which can be so handled as to arouse discontent. But the Committee have discounted all this, and may be relied upon to see their work properly carried through. Mr. Kemp had a little difference of opinion with Mr. Johnston, the previous Convener; but it was only upon the origin of the balance which is to be utilized. The origin of it was of little consequence; it was of more importance that the balance existed.

There have been mutterings in Dundee of late regarding the high price of the gas supplied by the Corporation. The charge, it will be remembered, was recently advanced by 6d., making it 3s. 10d. per 1000 cubic feet. What has, more than anything else, led to the rise of the present complaints, is the fact that in Broughty Ferry the Corporation have reduced the price of gas by 5d. per 1000 cubic feet, making it 2s. 6d. Broughty Ferry is an insignificant place when compared with Dundee, of which it is a suburb; and the expectation would be that circumstances should be the reverse of what they are. But in this instance the unexpected has happened. It is in the small place that the lower charge is made for gas; and the amount of the difference—1s. 4d. per 1000 cubic feet—is so large that it could not fail to attract attention. It has occasioned letters to the newspapers of late; and it was a subject of question in the Town Council on Thursday. In reply, the Town Clerk (Sir Thomas Thornton) explained that the Corporation gave too much for the gas undertakings, and that the annual payments they had to make were out of all proportion to the value of the works to the community. Mr. Ballingall followed with a statement to the effect that in Broughty Ferry they were enriching their gas with benzol, which was entirely an experiment; and, in his opinion, it was a very bold step to reduce the price of gas by 5d. To-day there is a letter in the "Dundee Advertiser" by Mr. J. R. Christie, the Convener of the Broughty Ferry Gas Committee, in which he controverts the statements of Sir Thomas Thornton and Mr. Ballingall. He denies that they are experimenting with benzol; the period of experiment being now past. He also points out that on the estimated output of gas in Dundee for this year—583 million cubic feet—the difference in charge to the community would be £38,866, and asks whether this sum, or anything like it, is laid aside in Dundee for capital purposes. The Broughty Ferry gas undertaking, he adds, is being financed on safer lines than is the Dundee one. I must say that the situation is an awkward one for Dundee, because the community will scarcely keep quiet if they are charged so much more for gas than are their neighbours. It is well known that the Dundee gas transfer was a very expensive one. Their water supply was also a most costly project. In these two most important municipal supplies, the former rulers of Dundee did not do good business. More than that, they have left, as a legacy to their successors, the clearing off of heavy capital which should have been reduced much more by this time than it has been. But, making full allowance for all these circumstances, the price of gas is still too high, when compared with what it is in Broughty Ferry. In this connection, the personal equation cannot be left out of account; and it must be freely acknowledged that Mr. A. Waddell, who has now gone to Dunfermline, has done remarkable things at Broughty Ferry. He has not been afraid to step out of the beaten track; and every time he has done so, his action has been to the benefit of the undertaking he managed. But then he has had Commissioners to deal with who supported him. Everyone has not that.

Richmond & Co., Limited, Gas-Stove Manufacturers, of London, Warrington, Stratford, Plymouth, Dublin, and Bournemouth, have sent us a specimen of a new production in trade literature, which they call their "War Calendar." It is excellently printed on cardboard, and eyeletted and strung for hanging. The central feature of the calendar is a reproduction of the firm's celebrated cartoon poster, in which ex-President Kruger is "Bringing his Goose to be Cooked." Underneath follows a diary of the principal events of the war, commencing with the sailing of Lord Roberts on Dec. 23, 1899, down to the surrender of Pretoria on June 5, 1900. The "landmarks" of the war, such as the relief of Kimberley, the capture of Cronje, the relief of Mafeking, are all noted. A calendar commencing July, 1900, carrying over until the end of June, 1901, is printed at the bottom, thus showing the dates for the early months of next year. The firm's well-known couplet:

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is the only trade advertisement appended to the card. Messrs. Richmond will send copies up to a dozen to any trader who will apply for them at any of the Company's Offices, or to the Advertising Department, 132, Queen Victoria Street, London, E.C.

"*Hardware Trades Journal*," Sept., 1900.

Messrs. Richmond & Co., Limited, London, Warrington, Stratford, and Plymouth, have issued a new illustrated catalogue, comprising the whole of their manufactures. The matter occupies some 220 pages; and the illustrations number no fewer than 453. These are all done in fine half-tone blocks. The compilation includes elaborate views of the Company's premises; and as a frontispiece there is introduced a splendid reproduction of the "Royal Sovereign" Gas-Fire, heavily embossed, and done in thirteen colour printings. The cover is also embossed, corded, and has a ring attached, so that the book can be hung upon the office wall. *We heartily congratulate the firm upon their enterprise, and upon the success attending it.* If required, the list can be obtained in two sections—the first dealing with Gas-Cookers, and the second with Gas-Fires. Messrs. Richmond have also prepared special Show-Room copies, which will be sent out as desired.

"*Hardware Trades Journal*," Sept., 1900.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 8.

Sulphate of Ammonia.—There has been rather more buying during the week; but supplies have been sufficient to meet the demand, so that quotations f.o.b. at the ports remain £10 15s. to £10 17s. 6d. per ton. For the most part, makers are realizing as their production becomes available; but in some quarters there is a disposition to hold for better prices. In the forward position, the quotations are for October-December delivery £11 per ton, and for October-March £11 5s. per ton. But these prices are above buyers' ideas; and there is further speculative selling abroad at below the equivalents.

Nitrate of Soda is steady at 8s. 1½d. to 8s. 4½d. per cwt., according to quality, on spot.

LONDON, *Sept.* 8.

Tar Products.—Taking business all round, things are not moving to the satisfaction of makers. There is only a poor market for creosote. Anthracene is more or less unsaleable; and other products do not reciprocate in the improved values that are obtaining in other markets. Carbolic acid is fairly steady; and the production is taken up. At this time of the year, however, the quantity is small. Benzols are not quite so brisk; but few makers have any to sell. The value of tar has decreased; and it is more than likely to see yet lower prices, unless products improve in value.

Average quotations for the week are: Tar, 16s. to 25s. Pitch, east coast, 37s.; west coast, 33s. Benzol, 90's, 10d.; special qualities for gas, 11d.; 50's, 11½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 3d.; crude naphtha, 3¾d.; heavy naphtha, 1s. Creosote, 1⅞d. Heavy oils, 3d. Carbolic acid, 60's, 2s. 10d. Naphthalene, 75s.; salts, 50s. Anthracene, nominal, "A," 4d.; "B," 3d.

Sulphate of Ammonia.—Dealings have not been numerous; and the market appears to be entirely in the hands of buyers. Very little stuff is offering; and the average value in all positions is noted at about £10 15s. per ton, less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—A generally active demand continues to be reported throughout this district for all descriptions of round coal; and rates are firm at the full quotations ruling last month. But there has been no further upward move, beyond a levelling up in prices at one of the principal Lancashire collieries where these had previously been below the general basis rates. For house-fire qualities, although there is not the pressure that recently prevailed, and collieries are now pretty clear of any deliveries in arrear on account of orders, they are still mostly moving away all they are raising; and practically nothing is as yet going into stock. For steam and forge coals, the demand is also well maintained; and there are no surplus supplies of common round coal on the market. For all descriptions of round coal, prices are strong, at about 16s. 6d. to 17s. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house-coal, and 12s. 6d. to 13s. for steam and forge coal. Engine fuel, if anything, is rather easier; and the unsatisfactory outlook in the cotton trade does not tend to improve the position. At many of the Lancashire collieries, stocks have been accumulating recently; and to clear off these for shipment, prices below the inland quotations have been taken. But even on inland sales it is exceptional where more than about 10s. 6d. per ton at the pit is now being secured for slack. Cheap supplies also continue to be sent in from other districts; and altogether the quantity of slack offering on the market is just now considerably in excess of requirements. For shipment there is still a tolerably good demand; but prices are getting back to something like their old level, and it is exceptional where more than about 15s. 6d. to 16s. per ton is being obtained for ordinary steam coal delivered at the Mersey ports. For the better qualities of round coal there is an increased demand, owing to the house-fire coal shipping trade having been thrown back seriously as a result of collieries until recently being so exceptionally pressed for inland requirements—this bringing a good many shipping orders for the better qualities of round coal to the ports on the Mersey, with prices strong at full rates. Coke is without further material change; Lancashire makers still holding to late rates, with Yorkshire furnace coke offering at the reduced prices previously referred to.

Northern Coal Trade.—The coal trade is very active; but the prices are now dropping slowly to those that prevailed before the Welsh strike. There is thus difficulty in quotation, as there is an almost daily variation. Most of the coal, however, is being delivered at prices below the quotations, which are to a considerable extent nominal. Best Northumbrian steam coals may be quoted as from 20s. to 22s. per ton, for immediate delivery; but for forward delivery, lower prices are ruling—the end of the Baltic season having its effect on this branch of the northern coal trade more than on any other. Steam smalls are steady at about 12s. 6d. per ton. As to gas coals, the nominal quotations are returning to those that have been current for months—about 17s. 6d. per ton f.o.b. for best Durham gas coals. Sales at this price are very few, and for small lots; for the great bulk of the output is taken up by the heavy contracts that are running, and which are generally at about 16s. per ton f.o.b. No additional contracts are reported this week. In the coke trade, there is considerable briskness. For export, best coke is now 32s. to 33s. per ton f.o.b. For blast-furnace coke, the quotation is 28s. per ton at the furnaces. Gas coke is now in a little fuller production; but prices are irregularly high, and are difficult to quote with any approach to accuracy.

Scotch Coal Trade.—There is no slackening of the demand, which seems to be unaffected by more than one disturbing influence. The output is satisfactory, and is very large. Prices are more settled, and may be given as: Main 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 17s. to 18s., and splint 17s. to 17s. 6d. The shipments for the week were 270,798 tons—an increase of 20,610 tons upon the preceding week, and of 85,748 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,205,531 tons—an increase of 1,344,200 tons upon the corresponding period of last year.

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SULPHATE OF AMMONIA PLANTS.

The Supply of Natural Gas in the Pittsburgh District.—Mr. J. C. M'Dowell, writing in the "American Manufacturer," gives the following as the latest figures obtainable on the above subject: Combined capital of the companies, $40,000,000; miles of pipe-line, 2500; number of wells, 1200; number of men employed, 2500; acres of land under lease, 40,000; rents and royalties paid annually, $500,000; cubic feet of daily consumption, 110,000,000; mills and factories supplied, 500; families supplied, 40,000; number of wells drilled annually, 300.

Tunbridge Wells Water Supply.—Last Friday, Colonel A. J. Hepper held an inquiry at Tunbridge Wells, on behalf of the Local Government Board, concerning the application of the Town Council for sanction to borrow £1200 for laying water-mains to Speedhurst. There was no opposition, and the proceedings were purely formal; the Deputy Town Clerk explaining that the proposal was part of a scheme for the extension of the water supply to outlying districts. At the termination of the inquiry, the Inspector visited the site.

Incandescent Gas Lighting at Dukinfield.—The incandescent gas-lights at Dukinfield have proved a great success. They were fixed on various dates commencing twelve months ago, and up to last month had burned 23,815 hours, consuming 4·6 cubic feet of gas per hour, equal to 109,550 cubic feet, at 2s. 11d. (£15 19s. 6d.), against 95,260 cubic feet by the ordinary burners, at 4 feet per hour, which would equal, at 2s. 11d., £13 18s. 6d., or a difference of £2 1s. The cost of maintenance of the 12 incandescent lamps during this period was as follows: 15 mantles at 9d. each, 11s. 3d.; 1 chimney, 9d.; 1 rod, 1d.—total, 12s. 1d. The illuminating power of these lights is calculated to be 105 candles, or almost ten times greater than that of an ordinary gas-burner passing 4 cubic feet per hour.

The Finances of the Heywood and Middleton Water Board.—According to the abstract of accounts of the Middleton Corporation for 1899-1900, the accounts of the Heywood and Middleton Water Board for the past financial year disclose a loss on the year's working of £386. The Heywood Water-Works (Transfer) Act, 1898 (by which the management of the undertaking was in October of that year transferred from the Heywood Corporation to the Board), provides that any deficiency in the revenue of the undertaking after the date of the transfer shall be made up out of the district funds of the boroughs of Heywood and Middleton in the proportions of their respective rateable values according to the county rate valuation for the time being in force. The Board, therefore, during the past year issued a precept for the payment of £186 2s. 5d. by the Middleton Corporation, as their proportion of the sum of £409 14s. 9d., the deficiency in the revenue of the undertaking for the half year ended March 31, 1899. The amount of the precept has been included in the current year's estimates. The Transfer Act further provides that any surplus shall be applied in the repayment to the Heywood Corporation of the sum of £25,000 which was expended by them in making good deficiencies in the revenue of the undertaking prior to the passing of the Act; and that the Board shall not, without the consent of the Corporation, make any reduction in the price of water until that sum shall have been paid.

Gas Lighting Restored at Alfreton.—The streets of Alfreton, after being in darkness for several months, owing to a dispute between the Town Council and the Gas Company as to the price of gas, are again to be lighted, the Council having agreed to the Company's terms. The latter demanded an increase of 6d. per 1000 cubic feet, and the Council offered 3d. The Council are promoting a scheme for the installation of the electric light.

Stockport Corporation Gas Supply.—At the meeting of the Stockport Town Council last Wednesday, the Mayor (Mr. T. Webb), as Chairman of the Gas and Electricity Committee, moved the adoption of the report of Mr. S. Meunier, the Gas Engineer, for the past financial year. He stated that the profit had been £8976. As compared with the previous year, the Committee had received £3247 more for gas, £1628 more for coke, £1283 more for tar, and £977 more for ammoniacal liquor—being a total increase on these items of £7135. It had cost, however, £6029 more for wages, coal, oil, and other materials, and they had allowed £1378 more in discounts.

Cost of the Abortive Water Scheme at Ilkeston.—At the last meeting of the Ilkeston Town Council, the Town Clerk (Mr. Wright Lissett) presented a return of the expenditure on the boring and sinking at Little Hallam. The figures were as follows: Expended on the boring, including Engineers' fees, £1813, for which £1800 was borrowed by the consent of the Local Government Board. The expenses of the sinking operations were £6076, made up thus: Plant and machinery, £963; bricks, lime, and cement, £314; timber, £108; explosives, £34; repairs and materials, £883; team work, £16; wages, including the amount paid to the Contractors, £2941; coal, £708; Engineers' fees, £80; insurance of men, £29. The grand total was £7889.

Prestatyn Water Supply.—At a special meeting of the Prestatyn Urban Council on Monday evening last week—Mr. John Jones presiding—the Water Committee recommended in a report that the Council should promote a Bill for the purchase of the water undertaking. The Chairman moved the adoption of the report, and explained that he had visited London in company with the Clerk, and had been advised that the best course for the Council to pursue, in consequence of the unsatisfactory supply of water, was to acquire the works. By this means the Council would have control of the water supply, which he considered should not in any place be in private hands. Mr. J. B. Linnell, agent to Mrs. M'Laren, who owns the works, said he had received a communication to the effect that an engineer was to be engaged to put matters right. Mr. J. Pritchard urged the Council not to rush on too quickly, and said he thought it better to confer with the owner. The Chairman and several councillors pointed out that for some years the water supply question had been under consideration, and Mrs. M'Laren could not improve it without additional powers, as she could only take what water came through a 4-inch pipe, which was not sufficient for the town. It was considered that the works, with improvement, would yield a good profit, and that there would be sufficient revenue to pay the interest and capital charges. The Council decided to apply for parliamentary powers forthwith.

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Atherstone and District Water Supply.—At Atherstone on Friday, Mr. H. Percy Boulnois, M.Inst.C.E., held an inquiry into an application of the District Council for sanction to borrow £6600 for works of water supply for the townships of Atherstone, Baddesley, Baxterley, Bentley, and Merevale.

The Local Government Board and the Erection of Carburetted Water-Gas Plant.—At the last meeting of the Stafford Town Council, a communication was received from the Local Government Board, in reply to the application of the Corporation for sanction to borrow £10,000 for the erection of plant for the manufacture of carburetted water gas, and for further extensions of the gas-works. The Board pointed out that, as the report of the Departmental Committee appointed to consider the danger attending the manufacture and use of water gas was still under consideration, they could not at present entertain the Council's application. At the meeting of the Oldbury District Council last Friday, the Gas Committee reported that they had had under consideration for some months the question of obtaining funds to enable them to pay for the new plant in course of construction at the works. The Local Government Board had so far declined to consent to a loan specially devoted to carburetted water-gas plant, pending the settlement by the Board of Trade of regulations with regard to its limited use. Mr. J. W. Wilson, M.P. (the Chairman of the Committee) was still in communication with Mr. Ritchie; but as legislation was required, it was impossible to expect these regulations before next year. Meanwhile, as the first payment for plant had become due, the Committee recommended that it be defrayed out of revenue for the present, and had made arrangements with the bank in case their balance should prove insufficient.

"Trade Union Tyranny."—Under this heading, a correspondent wrote to "The Times" last Thursday as follows: "Few things amuse the average reader more than the view of English law taken by law officers, and the rendering of it to the outside public. For example. A Judge of the Queen's Bench Division last week, on a trial arising out of the Taff Vale strike, summed up as follows: 'Masters and men are at liberty to make such terms as they choose.' A very simple statement, and one perfectly lucid; but, unfortunately, though theoretically plain, practically it is ignored. Thus, a man took some work on a firm in Birmingham more than two years since, and, being aged, made such terms as would suit himself and his employers. The trade society did not admit him at his age. Subsequently, they made an arrangement to include him, and invited him to join, which he declined. They then approached the firm to complain of his non-compliance; and, on the recommendation of the manager, he agreed to join, though he would receive no benefit but strike pay. When he presented himself for admittance, he was requested to state his present wages, which he, under orders, declined to do. For this gross misdemeanour his case was referred to the Building Trades Federation, with the result that the men on the firm were determined to be called out, unless the erring party was sacrificed, which was done, and the culprit informed that if he obtained work at any Birmingham firm he would be struck against as before. A striking example of Birmingham forwardness and free trade."

The Gas Undertaking of the Bakewell District Council.—The Auditor of the accounts of the Bakewell Urban District Council having stated that the profit on the gas undertaking was £564, the Chairman took the opportunity, at the last meeting of the Council, to point out that they had paid £712 in loans and interest; so that the total was £1276 profit made in the one year and nine months ending in March. It would pay 5½ per cent. on the £15,000 laid out since they started; so that the working was most satisfactory. The ratepayers now had a concern worth £16,000 or £17,000, for which they had not paid a penny.

North Middlesex Gas Company.—The accounts of this Company for the half year ending June 30, which will be presented at the ordinary general meeting to morrow, show that the sale of 43,125,000 cubic feet of gas for private and public lighting brought in a revenue of £8625, while the disposal of residuals yielded £1959. The total receipts were £10,934, and the expenditure was £7936. The balance carried to the profit and loss account is £2998; and the sum available for distribution is £4265. The Directors recommend dividends for the half year at the rates of 9½, £6 13s., and 5 per cent. per annum on the original, ordinary, and preference capitals respectively. The payment of these will absorb £2130, and leave a balance of £2135 to be carried forward. The Directors express their satisfaction at being able to report an increase of 23 per cent. in the sale of gas. The income from residuals has also been greater. The Directors have considered it necessary to devote a large sum to repair and renewals; and they say the expenditure has been fully justified by the results of the half-year's working.

Suffocation by Gas.—An escape of gas in the bedroom of the Dolphin Inn at Birmingham resulted last Tuesday in the death of the licensee, Charles Lyons, while his wife narrowly escaped with her life. They had only entered into occupation on the previous day, and had been engaged until an early hour of the morning in arranging their furniture. As they did not appear in the forenoon, apprehensions were aroused, and the bedroom door was forced open. Lyons was found at the very point of death, and his wife was almost dead. The former died directly afterwards; but the efforts made to restore Mrs. Lyons were eventually successful. It was found that the lower part of the gas chandelier hanging over the bed in the room had become displaced, the balance-weight having fallen, and so disconnected the sliding tube. As soon as practicable Mrs. Lyons was removed to the hospital, and slowly recovered consciousness. At the Coroner's inquest last Friday, the Jury returned a verdict of "Accidental death." The attention of the police having been called to the fact that Mr. and Mrs. Fletcher, who reside in Camp Street, Wednesbury, had not opened their house as usual last Friday, the front door was burst open in the afternoon. All the rooms were full of gas, and the occupants were lying upstairs unconscious. They were carried into the air, where a constable successfully resorted to artificial respiration, and then they were removed to the Infirmary. It was ascertained that Mr. and Mrs. Fletcher had been unconscious for about 16 hours; and, but for the fact that there was a broken pane of glass in the window enabling the gas to escape, they would no doubt have lost their lives. The gas had, it was assumed, entered the house from a fractured main.

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A New Service Reservoir for Swansea.—The Mayoress of Swansea (Miss Watkins) recently performed the ceremony of cutting the first sod of one of the two new service reservoirs which are being constructed with the object of securing for the residents in the higher parts of the town continuous supplies of water. The reservoir in question is situated on the top of the Town Hill, and will hold 3 million gallons of water. As it is considerably below the level of the main reservoir at Cray, pumping will be unnecessary. It will be 175 feet in diameter, and its greatest depth 19 feet. The cost is estimated at £9000. The work is to be completed in twelve months.

Water-Gas Plant for Darlington.—The General Purposes Committee of the Darlington Town Council last Wednesday decided, by a bare majority, to recommend the adoption of water-gas plant, which it was estimated would cost about £7000. This, it is calculated, will obviate the necessity of spending £30,000 in adding to the present plant. A statement was submitted from doctors in the town, who opposed the introduction of water gas on sanitary grounds. The proposal came before the Council on the following day; and, though it met with opposition from Alderman Harding, on the ground of the alleged dangerous nature of the gas, it was eventually sanctioned.

Opening of Additional Water-Works for Leamington.—Last Wednesday the formal opening took place of the Leamington Corporation's new well at Lillington; the ceremony being performed by Alderman Henry Bright, J.P., the Chairman of the Water Committee, who has been mainly instrumental in securing for the town the excellent water supply it now possesses. The well has been sunk in the new red sandstone, and is 170 feet deep; and the result is an additional yield of 450,000 gallons of excellent water per day—thus securing for the town an adequate supply for all time. The numerous company inspected the works, and all the pumps were set in motion. At the conclusion of the ceremony, a vote of thanks was proposed to Alderman Bright, on behalf of the town and Corporation, for his services; and it was very heartily accorded.

The Wexford Gas Company have placed with Messrs. R. Dempster and Sons, Limited, of Elland, a repeat order for Chester's furnaces and coke-settings.

The Farnley Iron Company, Limited, of Leeds, have been awarded a gold medal for the best Yorkshire iron exhibited by them in Class 64 at the Paris Exhibition, and also one for their fire-clay goods—glazed bricks and sanitary ware—shown in Class 72.

John Spencer, Limited, of Wednesbury and London, have just issued the twentieth edition of their price list of iron and steel tubes and fittings for gas, water, steam, hydraulic, and other purposes. It contains some useful tables; and there are blank leaves at the end of the list intended for memoranda.

The Hygienic Stove Company has been registered with a capital of £20,000, in £1 shares, to acquire the business carried on at Huddersfield by the Manchester Gas Cooker, Limited, and to carry on the business of gas-cooking range, gas fire and stove, boiling-burner, and general stove manufacturers, &c.

The "Bolletino delle Finanze, Ferrovie, &c.," announces the formation of a joint-stock company at Brussels, under the title of "L'Energie par le Gaz," with a capital of 1,000,000 frs., divided into 2000 shares of 500 frs. each, for the construction and sale of gas-engines and of all machines or appliances for the production, transformation, or utilization of gas power.

In a "Note" in the "JOURNAL" for the 28th ult., on "Rendering Wood Uninflammable," it was remarked that a ready and inexpensive process which would answer the immediate purpose in a reasonable degree was wanted about the works. We have since received a pamphlet setting forth the virtues of "Xylosote," which it is claimed not only reduces to a minimum the inflammability of wood, but leaves it odourless, and makes it hard and tough without, in the least degree, impairing its elasticity and pliability.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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[For Illustrated Advertisement, see Sept. 4, p. 608.]

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WANTED, at once, at a large Provincial Gas-Works, a Young Man as SUPERINTENDENT of Main and Service Laying, Public Lighting, &c. Highest references as to character and ability.
Apply, stating Wages required, to No. 3550, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MESSRS. J. & H. ROBUS, Engineers and Contractors, 20, Bucklersbury, London, E.C., require an ASSISTANT DRAUGHTSMAN. To one accustomed to up-to-date Carbonizing and Conveying Plant, also competent to measure up Brickwork and Excavations, a permanent position is offered.
Full Particulars on or before Friday, Sept. 14.

PORTLAND URBAN DISTRICT COUNCIL.

WANTED, immediately, a practical Man as GAS MANAGER for the Portland Gas-Works.
Present annual make about 19,000,000.
Salary, £110 per annum, with House, Fuel, Light, and Water. Engagement to be terminable by One Month's notice in writing.
Applications, stating Age and previous Experience, to be made, in applicant's own handwriting, accompanied by not more than three Testimonials of recent date, and addressed to me the undersigned on or before Tuesday, the 18th day of September, 1900.
J. HOWARD BOWEN,
Clerk to the Portland Urban District Council.
Portland, Sept. 5, 1900.

CITY OF BRADFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite applications for the position of ASSISTANT GAS ENGINEER, at a Salary of £300 per annum.
Candidates must have had a thoroughly practical experience in Gas Engineering and Gas-Works Management.
Applications, endorsed "Assistant Gas Engineer," and stating Age and Qualifications, with *copies* of not more than three recent Testimonials, to be addressed to me on or before Sept. 20.
Canvassing will be considered a disqualification.
FREDERICK STEVENS,
Town Clerk.
Town Hall, Bradford,
Aug. 31, 1900.

SHEFFIELD UNITED GASLIGHT COMPANY.

SUPERINTENDENT OF MAINS.

WANTED by the Directors of this Com- pany, an experienced and competent Man to superintend their Mains and Services Department. He must thoroughly understand the working of Governors, and be able to advise as to the correct sizes of Pipes required to ensure an adequate supply of Gas in all parts of the Company's district.
There are 460 miles of Mains in use at the present time.
Applications, marked "Superintendent of Mains," stating Age, Married or Single, previous Engagements, and Salary required, to be made by letter only, addressed to Sir Fredk. T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Friday, Sept. 28, 1900.
Testimonials not to be sent till asked for.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
Sept. 4, 1900.

SECOND-HAND VALVES WANTED.

TWO 8 inch or 10 inch diameter Four- Way PLUG VALVES.
J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

LAMP COLUMNS.

WANTED, at once, about Two Dozen Second-Hand LAMP COLUMNS.
Prices and Particulars to be sent to No. 3554, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to Hire for a few Months, Four RAILWAY TANK WAGGONS, to carry Tar.
Apply, by letter, to No. 3553, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Two Tangye Horizontal ENGINES, 10 inch Cylinders, 20 inch Stroke, complete with Gas Exhausters, Pipes, Valves, &c. In excellent condition.
Address R. H. LONGBOTHAM AND CO., WAKEFIELD.

J. FIRTH BLAKELEY & CO., Thornhill, Dewsbury, have FOR SALE:—
One Set of Three 6-ft. PURIFIERS.
One " Two 8-ft. "
One " Four 8-ft. "
One " Four 16-ft. by 12-ft. PURIFIERS.
Four 5-inch ANNULAR CONDENSERS.
Four 10-inch " "
Six 16-inch " "
"Cutler" ¾ million WATER" CONDENSER.
Wrought-Iron TOWER SCRUBBERS, 3 ft. by 14 ft., 3 ft. 6 in. by 27 ft., and 7 ft. by 32 ft.
Cast-Iron TOWER SCRUBBERS, 3 ft. 6 in., 5 ft., and 6 ft. diameter.
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.
"Holmes" & "Clapham" WASHER-SCRUBBERS.
"Livesey" & "Cripps" WASHERS.
4-in., 6-in., 8-in., and 10-in. STATION METERS.
Splendid GASHOLDER, 50 ft. by 20 ft.
RETORT IRONWORK, MODERN HYDRAULICS.
Telegrams: "BLAKELEY, THORNHILL LEES."

GLASGOW INTERNATIONAL EXHIBITION, 1901.

GAS LIGHTING.

THE Executive Council are prepared to receive PROPOSALS for EXHIBITS of INCANDESCENT and OTHER SYSTEMS of NOVEL GAS LIGHTING for Illuminating the Grounds and Detached Buildings of the Exhibition. For such Exhibits gas will be supplied free of charge.
Application to be made to the undersigned,
H. A. HEDLEY,
General Manager.
36, St. Vincent Place, Glasgow,
Aug. 30, 1900.

"CUTLER'S" Condenser, ¾ million day, equal to new; weight 12 tons; accept £100 on rail, Berkshire, if sold promptly.
J. F. BLAKELEY, Thornhill, DEWSBURY.

HIGH PRICED COAL.

SMALL Gas Authorities should im- mediately adopt an EXHAUSTER, and thus make probably at least 750 cubic feet of gas more from each ton of Coal carbonized. Several small sets *in stock*, both New and Second-hand.
Address J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SECOND-HAND PHOTOMETERS.

MESSRS. Alex. Wright & Co., Ltd., have several second-hand EVANS & LETHEBY PHOTOMETERS, complete with Instruments in thorough working order and good condition, which they can offer at greatly reduced Prices.
Write ALEX. WRIGHT AND CO., LIMITED, Precision Works, 81, Page Street, WESTMINSTER, S.W.

STATION Meter to pass Two Million feet per day FOR SALE. Connections 18 inch diameter; of modern construction. Will be moved and refixed by the Makers. Suitable for either Coal or Water Gas.
New LETHEBY PHOTOMETER, "Improved Edinburgh Model," by Sugg & Co. Specially designed for use in small Office. Dimensions, 7 ft. 3 in. by 5 ft. 6 in. by 1 ft. 10 in.
For Prices apply to JAS. WRIGHT, Gas Engineer, Bridge House, Blackfriars Bridge, LONDON, E.C.

BOROUGH OF CHORLEY.

THE Corporation of Chorley are pre- pared to receive TENDERS for the supply of a quantity not exceeding 300 Tons of OIL suitable for the manufacture of Carburetted Water Gas.
A full description of the Oil, with a sample, must be sent with the Tender. The Oil must be delivered free in Tank Waggons at Chorley Station in such quantities and at such times as the Engineer may require.
Any further Particulars may be obtained from Mr. J. McCubbin, Gas Manager.
Tenders to be sent to me on or before Tuesday, the 18th inst.
The Corporation do not bind themselves to accept the lowest or any Tender.
By order,
JNO. MILLS,
Town Clerk.
Town Hall, Chorley,
Sept. 6, 1900.

LONDON COUNTY ASYLUM, HANWELL, W.

THE Sub-Committee for the Control and Management of the above-named Asylum are prepared to receive OFFERS for the purchase of TAR for the Nine Months ending June 30, 1901.
Terms, Cash on Removal.
Forms of Tender, containing estimated quantity for Sale, may be obtained on application to the undersigned.
Tenders, duly filled up, must be sent in sealed covers, marked "Tender for Purchase of Gas Tar," to me by or before Nine o'clock a.m., on Saturday, Sept. 15, 1900.
The Sub-Committee do not bind themselves to accept the highest or any Tender.
R. W. PARTRIDGE,
Clerk of the Asylums Committee.
London Asylums Committee Office,
6, Waterloo Place, S.W., Sept. 3, 1900.

RADCLIFFE AND PILKINGTON GAS COMPANY.

THE Directors of this Company are pre- pared to receive TENDERS for the construction and erection of a Single-Lift GASHOLDER, 138 feet diameter and 30 feet deep, with Guide-Framing and Roof Trussing.
The Specification and Drawings may be seen at the Gas Offices, Radcliffe, and at the Offices of the Engineers, Messrs. Thomas Newbigging and Son, 5, Norfolk Street, Manchester.
Copies of the Bill of Quantities and Form of Tender may be obtained from the latter on deposit of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Gasholder, Contract No. 2," to be addressed so as to reach me not later than Noon on Tuesday, the 2nd day of October, 1900.
The Directors do not bind themselves to accept the lowest or any Tender.
JAMES BRADDOCK,
Manager and Secretary.
Gas Offices, Radcliffe,
Sept. 6, 1900.

CORPORATION OF BLACKPOOL.

THE Gas Committee are prepared to receive TENDERS for the surplus TAR produced at their Gas-Works during the next Twelve Months from the 30th of September, 1900.
Particulars from the undersigned.
Tenders to the Chairman by the 22nd inst.
JOHN CHEW,
Gas Engineer.

ROCHESTER, CHATHAM, AND STROOD GASLIGHT COMPANY.

RETORTS, &c.

THE Directors invite Tenders for the supply of FIRE-CLAY RETORTS, FIRE BRICKS, and CLAY.
Specification and Form of Tender may be obtained from the undersigned, to whom Tenders, endorsed "Retorts, &c.," must be delivered on or before noon of Monday, Sept. 17, 1900.
J. M. VEEVERS,
Engineer and General Manager.
Gas Offices, Rochester,
Sept. 6, 1900.

BOROUGH OF LEIGH.
(GAS DEPARTMENT.)

THE Gas Committee of the above Cor- poration invite TENDERS for the purchase of the surplus TAR produced at their Gas-Works, for a period of Twelve Months ending Sept. 30, 1901.
Forms of Tender and any further Particulars may be obtained from the Manager, Mr. John Foster, Gas-Works, Leigh.
Sealed Tenders, to be endorsed "Tar," to be delivered to me on or before Twelve o'clock noon on Saturday, the 22nd day of September, 1900.
By order,
PEREGRINE THOMAS,
Town Clerk.
Town Hall, Leigh, Lancs.,
Sept. 1, 1900.

BOROUGH OF LEIGH.
(GAS DEPARTMENT.)

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of 600 6-inch CAST-IRON PIPES.
Forms of Tender and any further Particulars may be obtained from the Engineer, Mr. John Foster, Gas-Works, Leigh.
Sealed Tenders, to be endorsed "Cast-Iron Pipes," to be delivered to me the undersigned on or before Twelve o'clock noon on Saturday, the 22nd day of September, 1900.
By order,
PEREGRINE THOMAS,
Town Clerk.
Town Hall, Leigh, Lancs.,
Sept. 1, 1900.

COMMERCIAL GAS COMPANY.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the surplus BREEZE produced at their several Works, for the Twelve Months ending the 30th of September, 1901.
The quantities are estimated to be as under, but the same cannot be guaranteed, and may be more or less:—
At the Stepney Works, on the Regent's Canal—
1000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
1000 chaldrons (of 48 bushels) of Rough Pan Breeze.
At the Wapping Works, on the River Thames—
2200 chaldrons (of 48 bushels) of Fine Coke Breeze, and
2200 chaldrons (of 48 bushels) of Rough Pan Breeze.
At the Poplar Works, in Bow Creek (free waterway)—
5000 chaldrons (of 48 bushels) of Fine Coke Breeze, and
5000 chaldrons (of 48 bushels) of Rough Pan Breeze.
The Tenders may be for the whole or for one or more Works separately.
The Contractors must give security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.
The Form of Agreement to be signed can be seen at the Company's Offices.
Tenders, sealed, and endorsed "Tender for Breeze," to be delivered here not later than the 13th of September prox.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Commercial Gas-Works, Stepney, E.,
Aug. 27, 1900.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday, the 4th of October, 1900, at Twelve o'clock noon precisely, pursuant to Act of Parliament.
The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED from the 20th of September inst. to the 10th of October inclusive, and RE-OPENED on the 11th of October, on which day the Dividends on this Stock will be payable.
Notice is also Hereby Given, that after the termination of the Ordinary General Assembly an Extraordinary General Assembly of the Proprietors of the Company will be held for the purpose of considering and determining as to the creation and issue of Debenture Stock authorized to be raised under the provisions of the Metropolis Water Act, 1899, with the Consent of the Local Government Board, which has been duly given.
By order,
I. A. CROOKENDEN,
Secretary.
15A, St. Helen's Place,
Bishopsgate, E.C., Sept. 5, 1900.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 26th inst., at Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect Two Directors and One Auditor in place of those who go out by rotation, but who are eligible for re-election.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 15th inst., and RE-OPENED on the 27th inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard, Lombard Street, London, E.C.,
Sept. 5, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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ESTABLISHED 1820.

SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER
Inquiries Solicited.

BOLDON GAS COALS.

Yield of Gas per Ton.	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
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STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
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FOR
GAS PURIFICATION.

For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED. —
1, FENCHURCH AVENUE, LONDON, E.C.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL CO., LD.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500	Cub. Ft.
Illuminating Power	16·9	Candles.
Coke (of good quality)	67·5	per Cent.
Sulphur	0·58	,,
Ash	2·73	,,

For Price, &c., apply to the
WEARDALE IRON & COAL CO., LD.
QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS-FITTINGS.

BURNERS
Welsbach Pattern
per 7/6 Doz.

WRITE FOR CATALOGUE.

WHOLESALE FITTINGS COMPANY
80, Commercial Road, London, E.

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TYNE
BOGHEAD CANNEL.

Yield of Gas per ton . . . . 13,155 cub. ft.
Illuminating Power . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . 10,500 cub. ft.
Illuminating Power . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . 10,500 cub. ft.
Illuminating Power . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE, SON, & HUNTER,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

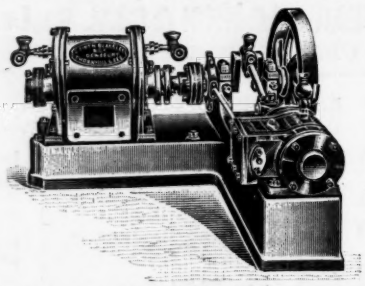
For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

J. Firth Blakeley & Co.,

Gas Engineers,

Thornhill, DEWSBURY.



The **High Prices of Coal** should induce Small Gas Authorities to adopt an Exhauster, and thus effect a large saving in Coal.

Probably at least 750 cubic feet more Gas being made from each Ton of Coal Carbonized.

Several Sets of EXHAUSTING PLANT in Stock, both New and Second-hand.

Particulars sent on application.

Thorough Efficiency Guaranteed.

Exhausters, any capacity.

NEW GAS PLANT OF ALL KINDS. RETORT WORK, CONDENSERS, WASHERS, SCRUBBERS, PURIFIERS, METERS, GOVERNORS, GASHOLDERS, VALVES, &c., IN STOCK OR PROGRESS.

Photos. sent. Inspection invited.

Telegrams: "BLAKELEY, THORNHILL LEES."

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

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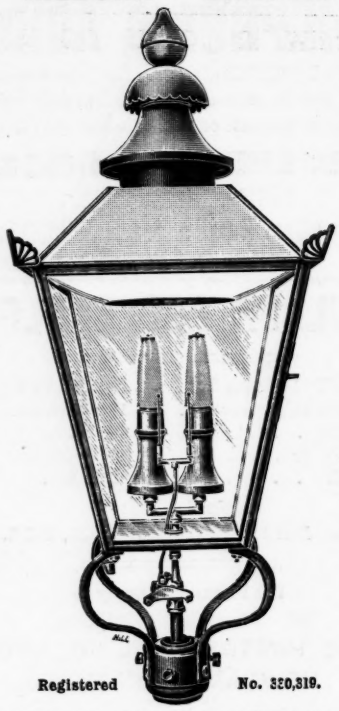

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Fitted with Steel Enamelled White Reflector.

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ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,

CHESTERFIELD.

LONDONDERRY GAS COALS

FROM THE

LONDONDERRY COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.

Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR,

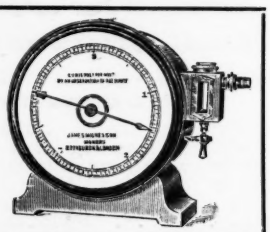
COUNTY OF DURHAM.

JAMES MILNE & SON, LTD.,

GAS ENGINEERS

MILTON HOUSE WORKS EDINBURGH.

LONDON. —— LEEDS. —— GLASGOW.



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"ACETYLENE:"

A HANDBOOK FOR THE STUDENT AND MANUFACTURER.

By VIVIAN B. LEWES, F.I.C., &c.,

Professor of Chemistry, Royal Naval College, Greenwich; Chief Superintending Gas Examiner to the Corporation of the City of London, &c.

ABOUT 1000 PAGES AND 228 ILLUSTRATIONS.

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The History of Acetylene from its Discovery to the Introduction of Commercial Acetylene.
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GAS IMPROVEMENT CO., Ld.

And 104,
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Gas and General Engineers.

Telegrams: "STOKER, MANCHESTER;" "RADIARY, LONDON."

SOLE MANUFACTURERS AND CONTRACTORS FOR

WEST'S PATENT REGENERATOR SETTINGS

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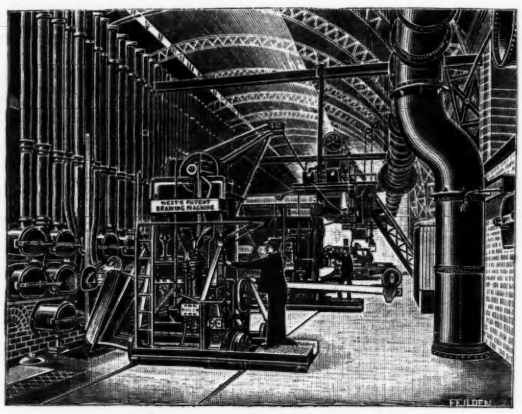
INCLINED OR HORIZONTAL SYSTEMS.

Constructed on Practical Scientific Principles to produce the Best Economical Results.



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COMPRESSED AIR AND ROPE DRIVEN CHARGING AND DRAWING MACHINERY

FOR

GAS-RETORTS.

Proved to be the quickest and most Economical Stoking Machinery in the Market.

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MANUAL CHARGING AND DRAWING MACHINERY

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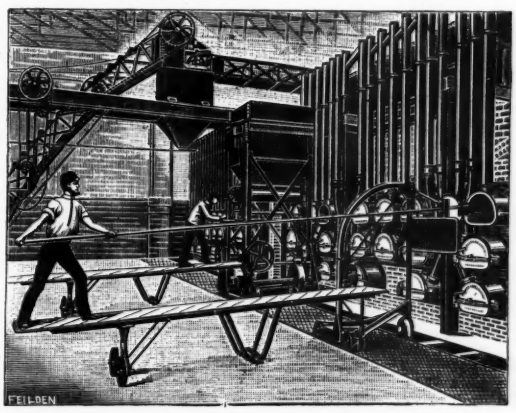
GAS-RETORTS.

Extensive list of Works where in operation sent on application.



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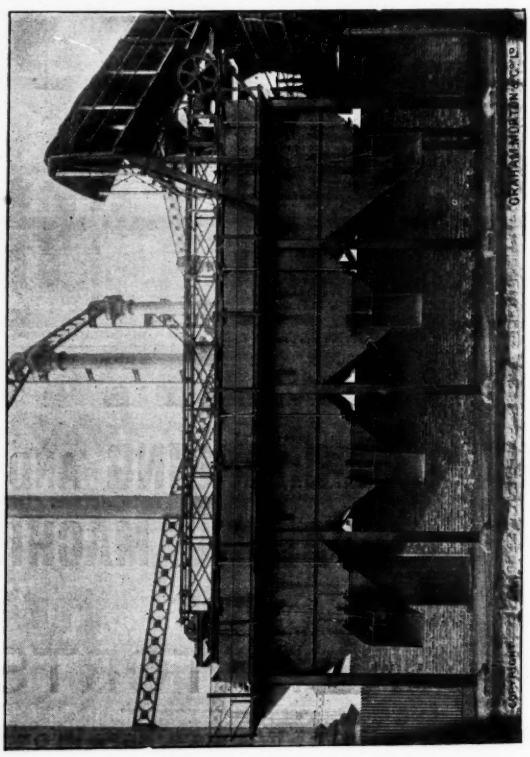

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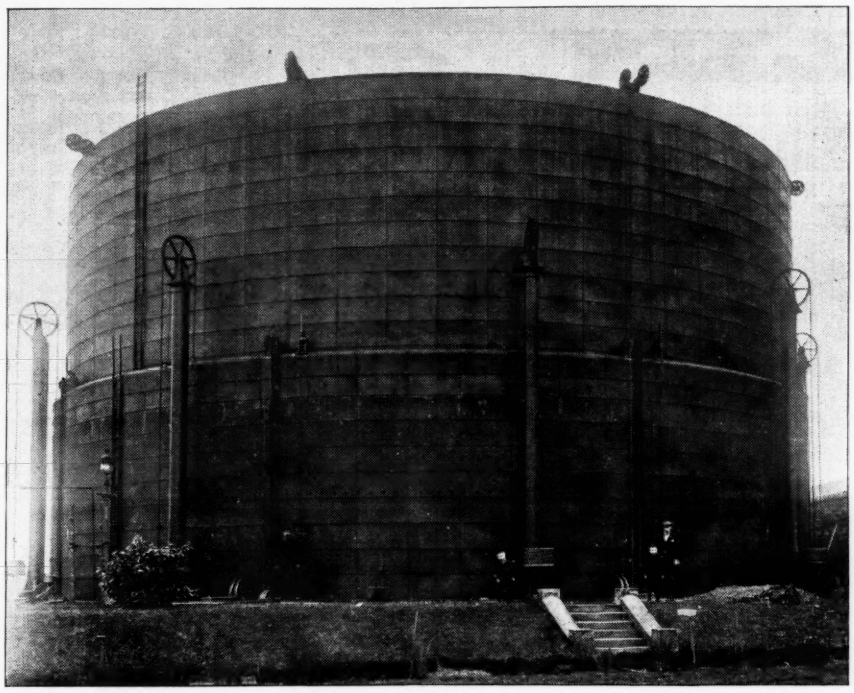

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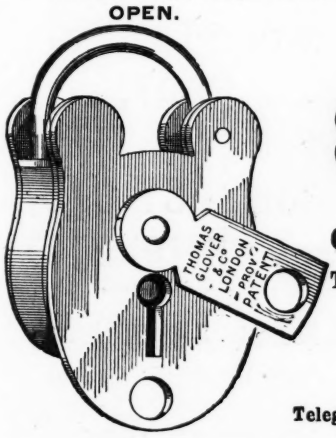

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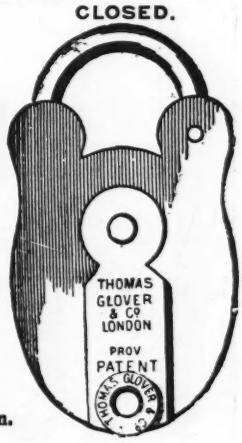

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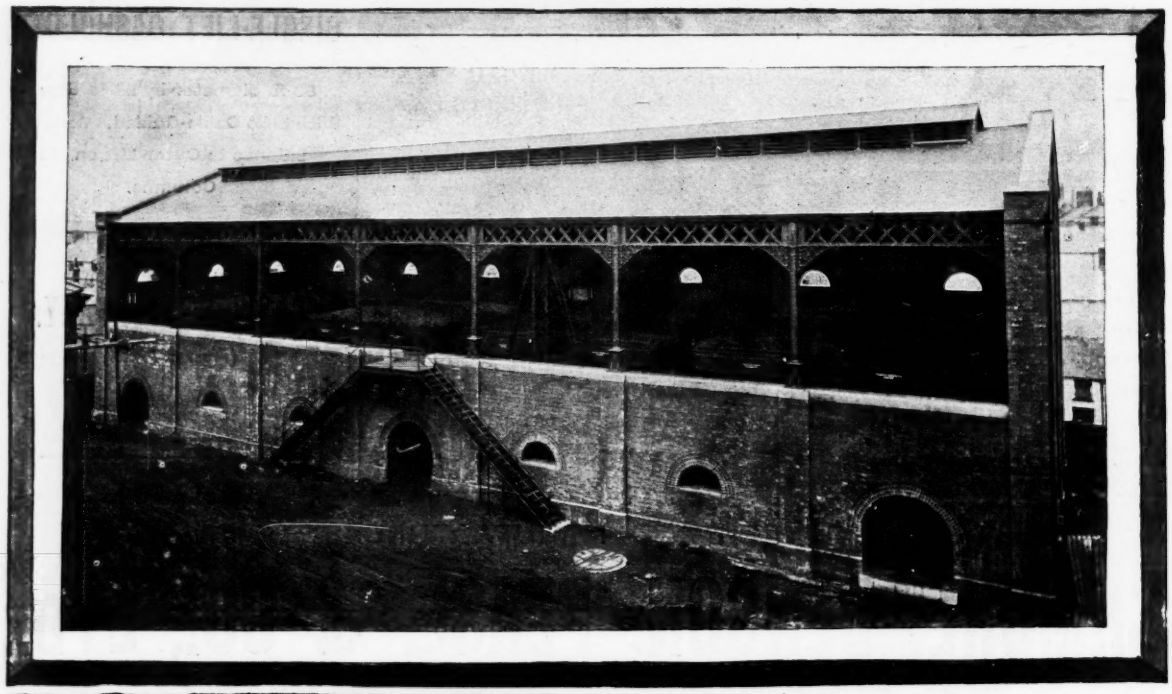

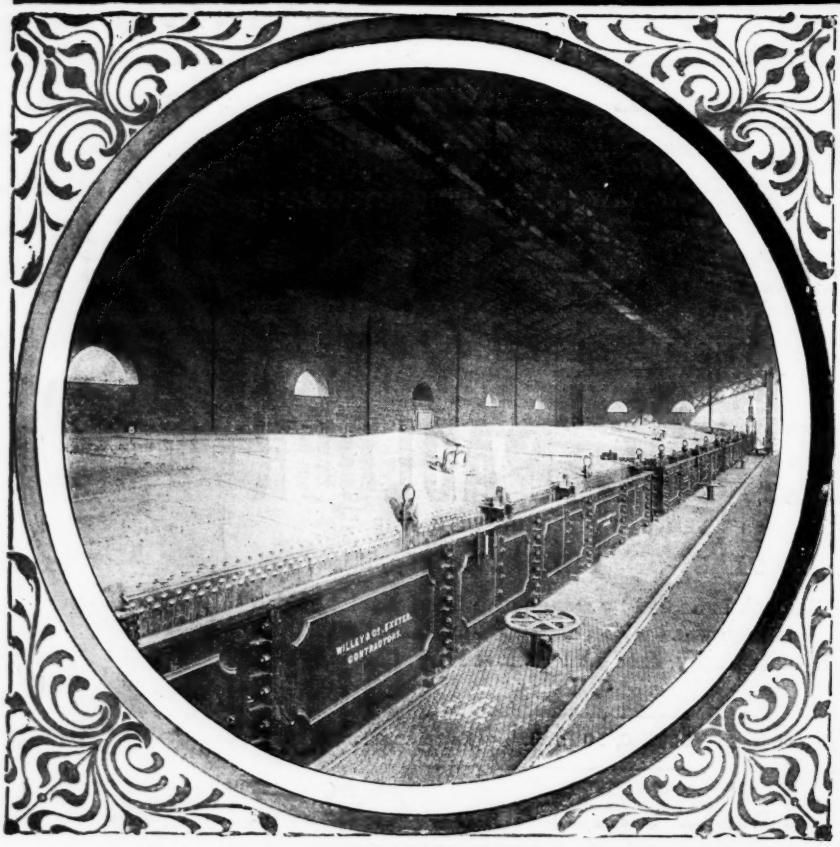

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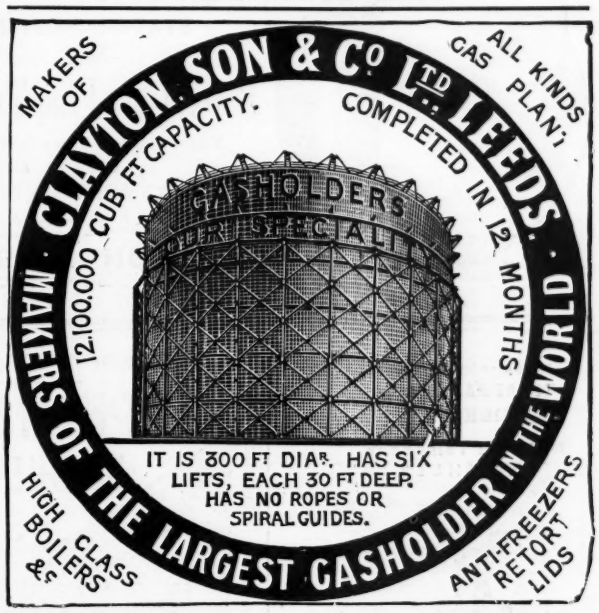
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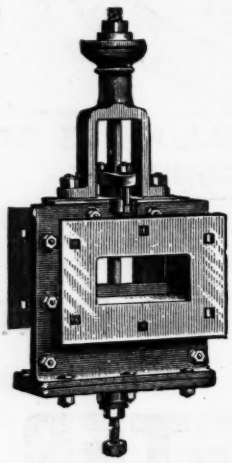

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